Effects of the Biographic factors and Religious Convictions on Littering to Enhance Waste Management in Pretoria City, South Africa

by

RONALD MATHE

Student number 49128892

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DECLARATIONS

Student number: 49128892

I Ronald Mathe, student number 49128892 want to declare categorically that the content of this dissertation is my own authentic work. However, there are some sections of this project wherein I used other people's work and in doing so I have acknowledged them in reference format, both in text and reference list. This project has never been submitted in any other university in the history of mankind; and I therefore guarantee that this work is my own legitimate work.

Signature……. Date:……..
(MR R MATHE)

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Abstract

The economic and population growth have led to the increased volumes of municipal solid waste in South Africa, hence more pressure to the waste management facilities. Municipal solid waste management is a by-product of everyday living, this is the reason why there is an environmental burden caused by waste to the environment. This study was conducted in Pretoria within the three sampled areas, namely: Garsfontein, Marabastad and Pretoria Central Business District (CBD). The rationale of the study was to establish the influence and effects of biographic factors (age, marital status, educational background, gender) and religious conviction on littering. This project constitutes both qualitative and quantitative data collection methods. About 150 of the questionnaires were administered to each of the three sampled areas. Therefore, the overall proportion of the respondents was 450. Visual inspection was done in all the three sampled areas to observe the littering *status quo* and waste management situation in these particular areas. The visual inspection uncovered very interesting findings. It was established that Marabastad was cleaner in the morning than in the late hours while Garsfontein was clean throughout the day. Another problem that was discovered, amongst others was that of the condition of the bins in Marabastad and Pretoria Central Business District (CBD) which was bad compared to Garsfontein. From the questionnaire, it was found that the 72% of elderly respondents (< 36 yrs) are more environmental conscious than the young people (18-35 yrs) who 83% of them claim to litter when there is no bin. Further, among young people, 78% said litter cigarette butts and 93% of these said better street cleanliness would help reduce littering. 72% of adults said religious convictions would help reduce littering. The chi-square and correlation coefficient statistical data analysis methods were used to establish the relationship between different biographic and religious variables. Gender, marital status, monthly income, age and religious conviction were all found to have significant effects on issues regarding littering in the city.

Key Terms

Biographic factors, Age and Littering attitudes, Religion and littering, Gender and littering, Educational background and littering, Littering in Pretoria, Enhance waste management, Waste management, Marital status and littering, Solid waste, Waste, Environmental perceptions,

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ABBREVIATIONS

CBD	Central Business District
DEA	Department of Environmental Affairs
EPR	Extended Producer Responsibility
IWMP	Integrated Waste Management Plan
IWMS	Informal Waste Management System
MOC	Ministry of Construction
MOEP	Ministry of Environmental Protection
MSWM	Municipal Solid Waste Management
NSEL	Nova Scotia Department of Environment and Labour
NWMS	National Waste Management Strategy
P	Probability
RSA	Republic of South Africa
STATSSA	Statistics South Africa

Chapter 1: Introduction

The municipal solid waste is regarded as trash, garbage which consists of everyday items such as product packaging, furniture, clothing, food craps, newspapers, bottles, etc (Erkut *et al*. 2008). Solid waste management is a by-product of everyday living, this is the reason why there is environmental burden caused by waste. It should therefore be noted that the idea of eliminating the solid waste in the society is currently impractical, however what is practical is the management of solid waste in a manner that is effective and scientifically approved. This is necessary for sustainable urbanisation and development. Littering is, and continues to be a widespread global problem; but there are parts of our cities, towns and villages where this crisis is minimal. Taxi ranks in Pretoria are commonly unsightly due to littering; however the suburbs seem to be very clean. The people living and working in Pretoria are increasingly becoming careless when it comes to taking care of the public environment as compared to their own private environment. Most people do not mind to litter in public areas as compared to their own homes. Little has been done in an attempt to address this widespread problem of littering in South Africa, especially with reference to public places. However, legislations without enforcement do not yield compliance in most cases; this is the case in South Africa where there is weak enforcement to those who transgress the environmental legislations. The public areas including taxi, train, and bus stations continue to be one of the areas hard-hit by littering, wherein you find litter such as empty cans and fruit peels lying everywhere. Litter makes the environment look unhygienic and unattractive. However, factors such as gender, income, marital status, and religious convictions have a fundamental effect on the attitude related to street littering (Al-Khatib *et al*. 2009). Therefore, this project will seek to assess and evaluate all the aforementioned factors and their influence on street littering and also to assess the perception of people on littering. Litter has gone from being perceived as the aesthetical crisis to be a serious environmental challenge (Vasilind *et al*. 2002 as cited by Al-Khatib 2009).

Aesthetic blight is an impact that one cannot quantify, and its impact is substantial. There are a lot of debates in as far as the issue of littering is concerned. But this will actually show you that littering is a problem in the society, no matter the volume and extent. Littering can also cause injuries, especially when it comes to broken bottles which are lying on streets, especially to children when they are playing. It should be understood that littering has negative economic implications in reference to its

collection and disposal. This will require people to be hired to remove litter and also the transport to carry these wastes to the landfill. The presence of social pressure can play an important role in reducing the prevalence of littering in most areas. Poor packaging of the commercial products is one of the factors that could influence littering. Good packaging has a potential to influence the people to re-use the packaging that was supposed to be discarded. It is paramount to have the sufficient waste receptacles, clean and attractive to encourage the people to drop their waste. Mostly, the rubbish bins are filled to the brim and sometimes it even over flows; it is by these reasons why people lose the eager to drop their waste to the receptacles (Al-Khatib *et al.* 2009). Some bins are seen with flies and bees hovering on top; and this discourages people from getting close to the bins and at times they throw the rubbish to the bin and miss the spot and some are lazy to pick it and drop it in the bin again. It is this reason that wastes will accumulate just around the waste receptacles (Al-Khatib *et al*. 2009).

1.1 Background

The increasing amount of solid waste with increasing populations in developing counties has potential impacts to the environment, societal health and economic losses. It should be noted that the increase in population comes with a heavy environmental burden; hence there is a need to develop mechanism to resolve the issue of solid waste. The issue of solid waste management in South Africa is governed by diversity of the legislative framework ranging from the supreme law which is the constitution to the municipal by-laws. It is inscribed within the constitution of the Republic of South Africa that: " everybody has the right: a) to the environment that is not harmful to their well-being, b) to have the environment protected, for the benefit of the present and future generation through reasonable legislative and other measures that – i) prevent pollution and ecological degradation, ii) promote conservation and, iii) secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development" (RSA Constitution, no: 108 of 1996). Little has been done in an attempt to address this widespread problem of littering in South Africa, especially in public places. There is a need in this case to create a societal communication in an attempt to resolve the issue of solid waste management in the form of littering. This engagement must seek to establish the rationale why littering continues to be a problem and it can be mitigated and resolved. There is also a perception that religious conviction, biographic factors

(gender, age, marital status) and economic factors have an influence on littering. This project establishes the reality with regards to these factors and also suggests ways to abate this problem by looking at the areas of concerns. This will assist in coming with sustainable and effective ways to deal with this crisis.

1.2 Statement of the Research Problem

Although South Africa has recognized the problem of municipal solid waste management and came with progressive legislations and strategies to deal with the problem, to date, little detailed studies have been carried out on the cause of solid waste problems, especially amongst the people living in cities. The National Waste Management Strategy (DEA: NWMS 2011) recognises and addresses many challenges South Africa faces with regards to solid waste management, but it does not address all the root cause of the problem. Section 27 of the National Environmental Management (DEA): Waste Act, 2008 (Act no.59 of 2008) seeks to control and mitigate the problem of littering by outlining that any person who owns a private land where the public has an access must provide rubbish bins. This very piece of legislation also restrict people from dropping, throwing or spilling any litter in a public space, land, watercourse, street or road where people have an access to. The National Environmental Management Act (DEA) 1998 (Act no.107 of 1998) also gives prescriptions to solve the problem of littering without addressing its root cause. If ever the there is a failure to understand the root cause of the littering problem, therefore there will be a high possibility that the problem persists. Hence, it is important to investigate factors that have an influence on littering such as gender, age, income, marital status, place of residence, educational background and religious convictions. This assists to know as to which factors need to be prioritised in addressing this littering challenge, and eventually establishing sustainable solutions to this problem of littering.

1.3 General and Specific Objectives

1.2.1 General Objective

To assess the effects of gender, age, income, marital status and religious convictions on the attitudes and practices related to street littering in Pretoria City.

1.3.1 Specific Objectives

- To investigate the perception people have in relation to street littering
- To assess the correlation between littering attitudes and practices of people in Pretoria City with respect to five socio-economic characteristics (gender, age, income, marital status and religious convictions).

1.4 Justification

Clean environment is not only a constitutional necessity for South Africans, but it is a basic need for everyone. The best way to effectively deal with any problem, generally, is to know the actual root cause of the problem. Littering has not only caused the environment to be unsightly, but it has for some times caused negative impacts on the biological diversity and human health. It is a given fact that tourists will always be keen and enthusiastic to visit an area which is clean and possessing recreational attraction. Therefore this speaks volumes to the fact that when the area is littered, tourists and people in general are unlikely to be attracted to that very place and this is likely to repel tourists, resulting in the country losing foreign currencies which could have played a major socio-economic role. This project will assist us to establish and understand the root cause of littering, and that will assist the government and people in general to devise some strategies to deal with this problem of littering. It will also assist in ensuring that the areas we live in are clean, aesthetic and attractive. This project will uphold section 24 of the constitution of the Republic of South Africa. Enhancing economic viability, clean environment and assisting the government to deal with littering problems. Economic strength will be addressed through a clean environment, which will attract tourists.

Chapter 2: literature Review

2.1 Review of the municipal solid waste management and problem of littering

2.1.1 Other developing countries

2.1.1.1 Solid waste management in India

The study by Srivastava *et al*. (2005) indicated that the municipal solid waste management is a sole responsibility of the urban local bodies and corporations. They ensure that there is a thorough management of the solid waste management in the country as whole. However the performance of these urban local bodies and corporations are poorly performing, the very same study stated. This poor performance has led to serious health problems which are caused by contamination of the water by these wastes; this also causes the environmental degradation. The very same study states that in India, there is a lack of skills and awareness of the need to adopt effective solid waste management services. It has been clearly stated from the very same study that the lack of skills and awareness has therefore resulted to under allocation of the finances and human resources by the government authorities and a general public apathy; thereby causing a chaotic waste problems.

From the study by Srivastava *et al*. (2005) shows that the higher the average studies of the people, the higher the average per capita waste generation. This actually means that the more one earns the more one release a lot of waste, maybe it is because those who earns a lot have an ability to buy commodities which eventually have a waste by-product. Because of the improper solid waste management in India there is an urgent need come up with a well thought integrated municipal solid waste management approach with the community's participation. The very same study suggests that one of the reasons why there is an improper solid waste management in India is because the participation of the people to solid waste management has been marginalised. Until the human factor is incorporated on the management of the municipal solid waste nothing will be progressive in as far as management of waste is concerned. The study also shows that Census (2001) indicated that the total population of Lucknow was 2.8 million, which they generated 1200-1400 metric tonnes of

municipal garbage per day. It further states that on average 70-75% of total solid waste generated was collected by the municipal corporation of Lucknow. Then the collection efficiency ranged from 60-70%. It must be noted that street sweeping is the only technique which is used as a primary way of municipal solid waste collection, the very same study stated. It was stated from the very same study that rapid urbanisation, population increase, influx floating population, lack of motivation and skills amongst municipal corporation staff, public apathy and lack of human resource development activities are the major hindering factors that impedes proper municipal solid waste management in Lucknow.

From the very same study by Srivastava *et al*. (2005) it was indicated that urban area city dweller in Lucknow is responsible for generating 400-450 g per day of waste as compared to rural areas that produce less than 200-250 g daily.

2.1.1.2 Solid waste management in Thailand

According to Mongkolnchairarunya (2005) in Asia most of the financial portion of the waste management goes to collection and transportation. The smaller portions of the budget is allocated to waste disposal methods such as composting, land fill and incineration methods. Other small fraction of the budget goes to solving problems at source, for reducing waste and increasing the level of material recovery, instead of using end of pipe methods. In case of the Thailand city, in 1998 the quantity of waste exceeded 37 250 ton per day or 13.6 million ton per year. According to the very same study 60-80% of the urban residences are served for solid waste collection and disposal. Similarly to the case of Lucknow, the sector that is responsible for the collection of waste is the local government. Based on the very same study there are local factors that have got the potential to cause problems in solid waste management which includes: cultural, economic and professional factors. The quantity and quality of the municipal professionalism have been questioned a lot.

From the study by Mongkolnchairarunya (2005) the street cleansing type of work is done by the maids. Moreover, there is a tendency that the children from well-off families are not educated properly on cleanliness and tidiness of their houses environment. Some of these children have a tendency of believing littering is essential because it creates jobs, which means it is the right thing to do. In reference to the very same study people in Thailand do not separate waste due to the reason

that there is no facilities and human involvement through awareness, knowledge and incentives to encourage the people. The other factor as stated in the very same study which has the potential to inculcate the problem of solid waste management in Thailand is the rapid economic growth. The economic growth caused the great increase in personal income and consumption. The study further explains that the economic growth within 1980-1990 promoted rapid urbanisation, and newcomers to a municipality may perhaps feel less sense of community and therefore less social motivation in the matter of waste disposal. This very study indicates that in Thailand people are used to receiving services from local government, especially solid waste management which is almost free of charge and they ignore improving the situation themselves. In the very same study it is indicated that the people in Thailand believes that all the responsibility of the public issues are vested on the government not to the community, so they fold their hands and believes the government will take care of all. The study also shows that it is not all the people who do not pay for the services, but there are some portion of the population who pays for these services. The study shows that the recycling initiatives aiming at promoting community involvement have been reported from several Asian countries in recent years.

From the study by Mongkolnchairarunya (2005) it is stated that the selected alternative solid waste management package consisted of four various facets including the community-based recycling project or garbage for eggs, the municipality-based organic waste fermentation project or bio-extract production, the school waste bank and the multi-stakeholders material recovery facility project.

2.1.1.3 Solid waste management in China

to the study conducted by Chen *et al.* (2010) demonstrated that the municipal solid waste management in China needs a special attention as it has become the largest municipal solid waste management generator in the world and the total amount of municipal solid waste it produces continues to increase. However the study indicates that China has made great efforts to improve municipal solid waste management. The very same study indicates that new regulations and policies have been issued, urban infrastructure has been enhanced, and commercialization and international cooperation have been encouraged. It also indicates that an overview is necessary to analyse the current state as well as new opportunities and challenges regarding municipal solid waste

management in China. Again the same study indicates that since the late 1990s, the amount of municipal solid waste management collected has been largely decoupled from economic growth and incineration has become an increasingly widespread treatment method for municipal solid waste management. According to the very same study China produced 190 million metric tons of municipal solid waste in 2004 and became one of the world's biggest municipal solid waste generators. In the very same study China has devoted considerable effort to managing its municipal solid waste. The study shows that from 1990 to 2004, investment in municipal solid waste treatment equipment and infrastructure increased 21 times and over 30 times more municipal solid waste is now treated or disposed of safely in the landfill. Furthermore safe disposal in 1990 was highly limited, the safe disposal rate reached only 53% in 2006 and various challenges remain.

Chen *et al.* (2010) again indicated that the regulations and policies are important tools for solid waste management and China, the Law of the PR China on the Prevention of Environmental Pollution Caused by Solid Waste (hereinafter referred to as the Law on Solid Waste) is the main legislation specifically pertaining to solid waste management and pollution control. The very same study states that the law stipulates the principles of waste management, responsibilities for waste supervision and administration, pollution control measures, and associated legal responsibilities. Furthermore the administrative and ministerial regulations of waste management must comply with this law. In December 2004, the Law on Solid Waste was amended for the first time since its enactment in 1996. Same as the South African National Environmental Management: Waste Act (DEA), 2009 (Act no.59 of 2008), the important amendment was the establishment of extended producer responsibility (EPR) as a key principle of MSWM. The study shows that the previous version specified only the producer's responsibility in the production process, whereas the amendment highlights the entire life cycle by extending the producer's responsibility to include the consumption and disposal of goods, thereby establishing a legal foundation for an integrated solid waste management system.

The same study again by Chen *et al.* (2010) elaborated that the legislation on solid waste, relevant administrative and ministerial regulations are issued by various governmental agencies and two of the major ministries are involved in municipal solid waste management as stipulated in the Law. Therefore, the first is the Ministry of Construction (MOC), which supervises and administers the cleaning, collection, storage, transportation, and final disposal of municipal solid waste. The second

is the Ministry of Environmental Protection (MOEP), which administers and monitors the collection, treatment, and final disposal of hazardous wastes, waste trade, and secondary pollution generated by the construction and operation of municipal solid waste treatment and disposal facilities. In addition, at least seven other governmental agencies are involved in municipal solid waste management. It is stated again that these agencies and several recent regulations issued by them. It should be again noted that at least four of these regulations are issued specifically for promoting commercialization of waste treatment and related services, in an attempt to transfer responsibilities from government to the private sector and to improve the effectiveness and efficiencies of municipal solid waste management. One of the prominent examples that they use is the one of the Notice on Charging Urban Waste Treatment Fee and Promoting Industrialization of the Waste Treatment Industry and the Opinion on Accelerating Marketization in the Municipal Public Utility Industry issued in 2002 laid the legislative foundation for charging the waste treatment fee as an economic measure to promote the institutional change in waste treatment.

Chen *et al*. (2010) showed that the progress in legislation and policies regarding municipal solid waste in China has been substantial, practice varies across the country. Furthermore, the recently released regulations and policies have increased attention to waste reduction and recycling under the banner of a circular economy, as well as to the encouragement and administration of the private sector involved in municipal solid waste. With regards to the solid waste finances, progress in the commercialization of waste treatment and services, funds for municipal solid waste management have become more abundant and diversified as they include local investments from both government and private companies, as well as financial aid from international organizations. It is again indicated from the very same study that investments from government on municipal solid waste treatment and disposal, which constitute a portion of the public spending on urban sanitation. The safe disposal capacity in China is less than 55% since 2002; the safe disposal includes landfilling, incineration, composting and recycling.

2.1.1.4 Waste management in Ghana

The study conducted by Mensah *et al.* (2013) clearly indicates that only about 10% of the waste is managed properly through land filling and incineration. The same study further elaborated of the improper dumping of waste at the unauthorised places, inappropriate technologies for landfilling and also the weak enforcement of the environmental regulations. All these have led to great environmental burden in Ghana. Mensah *et al.* (2013) again indicates that in Ghana, sorting and recycling of the municipal waste has not been realised. The most predominant way of dealing with municipal waste is through land filling, incineration or recycling of the insignificant portion of these wastes. This study indicates that the sites for the landfills are increasingly unavailable. The same study also indicates the composition of the municipal solid waste is dependent on culture, economic factors, food habits and the lifestyles. What is mostly regarded and prioritised in Ghana is separation from source of the municipal solid waste. Furthermore, the study shows that lack of land for efficient waste disposal, lack of awareness on effective management coupled with the non-implementation of strict environmental policies. Mensah *et al.* (2013) stated that in four metropolitan municipalities in Ghana they engineered landfills in each of these municipalities and it helps manage the municipal solid waste in these areas.

The study by Mensah *et al.* (2013) indicates that paper, plastics and the scrap metal are the main recyclables that are generated in large quantity in Ghana, hence increasing the market demand. However unavailability of less cost of the technologies for source sorting of these wastes is still a problem in Ghana. Most interestingly in Ghana as the very same study indicates, there is a very progressive waste management initiative by the group called the Zoomlion Ghana. This initiative is aimed at helping to promote effective collection of wastes by providing the homes with containers for different types of wastes. It is noteworthy to find out that the private companies also are making progress in terms of recycling of the recyclables. Mensah *et al.* (2013) again has established that there are some United Kingdom company that has completed the first phase of the construction of the largest engineered landfill to recover energy in Acra to serve over 3.5 million people. The responsibility of waste management in Ghana has been of the Ministry of Local Government and Rural development. The generation of the municipal solid waste in Ghana has indicated clearly indicated that there is a good prospect of the initiative of coming with the technology to recover

energy from municipal solid waste (Mensah *et al.* 2013). From the very same study there were four factors that justified the feasibility of energy production from the municipal solid waste in Ghana. The factors are: 1) the amount of the municipal solid waste generated, 2) characteristics and quality of wastes produced, 3) the technology type used for energy production and 4) economic conditions of the location of waste to energy plant.

2.1.1.5 Waste management in Cameroon

Manga *et al.* (2008) conducted the waste management study in Cameroon, with the study area of Limbe Municipality. The highest body responsible for the implementation of waste management in Cameroon is the Inter-Ministerial Commission for Municipal Waste Management, created under the direction of the Prime Minister and charged with formulation of waste management policies. The same study indicates that the waste management service delivery is the duty of the Municipal Councils, responsible for the provision and maintenance of the infrastructure. The study by Manga *et al.* (2008) shows that the source of funds are from the following 1) taxes and revenue generated by the council activities, 2) supplementary budgets, 3) lending facilities from the Government's Council Development Funds.

Manga *et al.* (2008) demonstrates that the waste management responsibilities are managed by the health and safety officers in the Hygiene and Sanitation Units of each of the Municipal Council. This study indicates that the higher amounts of biodegradable and plastic waste arise from middle income people. The underlying reason for this could be the increase in packaged foods and other materials. In Limbe, there is a door to door waste collection. These collections are done by the trucks that hoot as a signal to call the residents to bring the waste to be collected. The very same study indicates that there are areas that are called the fixed point collection. This is the communal disposal area provided with large bins. This is the widely used bins in Limbe. Like the case of South Africa, in Limbe there are scavengers that visit the curbside dumps to recover the recyclables to be sold for their livelihood. The Cameroonians' legislations have evolved with time especially within the past 10 years. Manga *et al.* (2008) indicated that the overarching problems of solid waste management in Cameroon include poorly formulated legislation, inefficient collection and poor recovery and disposal practices.

2.1.1.6 Waste management in Tanzania

The study conducted by Yhdego (1995) indicates that waste management in Tanzania in general is a serious environmental problem. The population growth of this country is said to be the main cause of the environmental problems in Tanzania. This very same study shows that no effort at all has been made to ensure that the environmental problems are resolved. The study further indicates that the quantity of waste which has to be sorted, collected, transported and disposed of has increased tremendously in recent years. Yhdego (1995) indicates that the hard hit areas are the smaller town as they receive minimal waste management services. The results of this are that it leads to the towns looking very dilapidated. This study again shows that the most predominant waste in Tanzania is primarily the vegetable waste, and other putrescible materials. The study outlines that the most wastes produced in the city were left near the house in open pits, streets, storm water drainage and markets. Yhdego (1995) explicitly shows that the uncollected wastes have in past years led to unsightly environment which reduces the beauty of the city.

The study by Yhdego (1995) showed that crude dumping is the most common method of waste disposal in Tanzania. This method of waste disposal has attracted a lot of scavengers who accrue most of the recyclables. This study also indicates that the most common ways of disposal in Dar se laam is through open dumping which is in the periphery of the small cities.

Yhdego (1995) demonstrated that the municipal solid waste in Dar se laam is managed by City Council. The institution that is tasked to execute the waste management related activities is the city cleaning service. The study indicates that the city cleaning council is responsible for 1) collection and disposal of waste, 2) Reporting to the City Engineering Department with regards to the maintenance of the vehicles, 3) policy preparation with regards to waste management.

2.1.1.7 Waste management in Nigeria

The study by Oguntoyinbo (2012) elaborated to the increase in population rate in the country Nigeria. The average amount produced in Nigeria per day is 0.49kg/capita/pay. This study indicates that the amount of waste generated in Nigeria is more than the capacity of the environment and the control of the authority that deals with waste management in this country. Oguntoyinbo (2012)

clearly indicates that the inability of the authority to properly deal with the waste in Nigeria is attributed to poor urban planning, policy formulation, urbanisation and lack of necessary resources to perform the waste management functions. The state and the local government agencies are the ones that are responsible for waste management in Nigeria. Based on the very same study, in Nigeria there are two systems that are available: formal waste management system (FWMS) and the informal waste management system (IWMS). The formal waste management system consisted of the private and government agencies involved in waste collection, transportation and disposal of waste. Hence the informal waste management system comprised of the unregistered and unregulated activities that includes the waste collection, sorting and re-use which is carried out by individuals, families, groups or small enterprise. All this was part of the holistic waste management in Nigeria. Furthermore the study by Oguntoyinbo (2012) outlined that informal waste management system consisted of the door-door waste pickers, street waste pickers and itinerant waste buyers.

Oguntoyinbo (2012) gives an indication that in Nigeria currently, recycling is mainly carried out by the informal waste management collectors, and many of them operate in urban areas.

2.2 Review on municipal solid waste in South Africa

2.2.1 Current status

The national waste baseline shows that South Africa generated approximately 108 million tonnes of waste in 2011, and 98 million tonnes was disposed of the landfill. In the order of 59 million tonnes is general waste, 48 million tonnes is currently unclassified waste and the remaining 1 million tonnes hazardous waste. Only 10% of all waste generated in South Africa was recycled in 2011.

Waste management in South African has many challenges including an economic and population growth, which actually means an increase in the waste generated. Therefore this causes huge pressure on waste management facilities. This means that more land will be required for the land fill sites, of which this land would have been used for other productive ways. In South Africa there is a growing complexity of the waste stream due to industrialisation and urbanisation. The complexity of the waste stream directly has got waste management problems. One of the problems of waste in South Africa is the availability of policies that do not enhance the waste hierarchy; this makes the

management of waste very difficult. The other challenge is the unavailability of recycling infrastructure which would enable separation of waste at source and diversion of waste streams to material recovery and buy back facilities. The waste management services are underrated financially, which means that there is acceptable level of waste services which are given minimal incentives. In South Africa, the disposal of waste is still more preferred than other options, which puts extensive pressure on the environment (DEA 2011).

2.2.2 Legislation governing waste management in South Africa

Africa South Africa is the country governed by the constitution, and this very constitution serves as the base of all the legislative frameworks in South Africa. However the section that governs the environmental issues within the bill of rights, which is section 24 of the constitution of the Republic of South Africa. The constitution of the Republic of South Africa states that: " everybody has the right: a) to the environment that is not harmful to their well-being, b) to have the environment protected, for the benefit of the present and future generation through reasonable legislative and other measures that – i) prevent pollution and ecological degradation, ii) promote conservation and, iii) secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development" (RSA Constitution, no: 108 of 1996). So the very constitution serves as the corner stone for better environmental management. The right that is articulated in the constitution includes the one of clean environment; therefore if ever the area is littered then it means someone's constitutional rights are violated. Littering is pollution and the constitution protects the citizens from all kinds of pollution. However this section of the constitution has led to the emergence of many policies to support it, this includes: National Environmental Management Act (DEA), 1998 (Act no.107 of 1998), this act led to the formation of the National Environmental Management: Waste Act (DEA), 2009 (Act no.59 of 2008), National Environmental Management: Air Quality Act (DEA), 2004 (Act no 39 of 2004) and many other more of these acts (RSA Constitution, no: 108 of 1996).

2.2.2.1 National Environmental Management Act, 1998 (Act no.107 of 1998)

The principles of environmental management outlines in the National Environmental Management Act (DEA),, 1998 (Act no.107 of 1998) stipulates that environmental management must place people

and their needs in the forefront. It also advocates that negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied. This means that pollution must be by all means avoided or minimised, this type of pollution includes land pollution in the form of littering, but not limited to this (National Environmental Management Act (DEA), 1998 (Act no.107 of 1998)). Section 28 of the same act states that every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment. This provision applies to littering as well, that every person who causes littering must apply the very same principle as stated above.

2.2.2.2 National Environmental Management: Waste Act, 2009 (Act no.59 of 2008)

This piece of legislation is the one that governs the waste management in the Republic of South Africa. It advocates for the protection of the environment, people and their well-being. Section 25 0 27 of the National Environmental Management (DEA), 2009 (Act no.59 of 2008) states that any person engaged in the transportation or storage of waste must take all reasonable steps to prevent any spillage of waste or littering from a vehicle used to transport waste. Failure to uphold this provision means that one would have infringed the act in question. It furthermore states that any owner of privately owned land to which the general public has access, must ensure that sufficient containers are provided to contain litter that is discarded by the public; and that the litter is disposed of before it becomes a nuisance, a ground for a complaint or causes a negative impact on the environment. Therefore this piece of legislation advocates for the protection of the environment and the people in general (National Environmental Management: Waste Act (DEA), 2009 (Act no.59 of 2008).

2.2.3 Bi-laws on littering

2.2.3.1 City of Cape Town Metropolitan Municipality

In South Africa, littering is mostly covered in municipal bi-laws. Municipalities develop the bi-laws to regulate some of the activities, including littering. According to the City of Cape Town (2009) no

person is allowed to drop throw, deposit, spill, dump, store or in any other way discard, any litter or waste into or onto any public place, municipal drain, land, vacant erf, stream, water course, street, road, wetland, coastline or on any place to which the public has access, or otherwise dispose of it nor may they allow a person under their control to do so. In the very same by law it was also indicated that the owner of private land to which the public has access must ensure that sufficient containers are provided to contain litter which is discarded by the public. The Director may direct, by way of a written notice to any persons to cease the contravention, in a specified time so to prevent a further contravention or the continuation of the contravention. It was also indicated in the very same by-law that whatever measures the Director considers necessary to clean up or remove the waste, and to rehabilitate the affected facets of the environment, to ensure that the waste and any contaminated material which cannot be cleaned or rehabilitated is disposed of lawfully. From the very same by-law it was uncovered that the Director may state that the person within a maximum of 5 working days remove the waste or litter, provided the Director may grant a further 2 days, on request of the person, to remove the litter or waste. Furthermore the by-law showed that any person who owns land or premises, or who is in control of or has a right to use land or premises, may not use or permit the use of the land or premises for unlawful dumping of waste and must take reasonable steps to prevent the use of the land or premises for that purpose. It was indicated again that ever the municipality elects to remove the waste or litter the person concerned shall be liable for the cost of such removal operation. This is different from the case of hazardous waste; the City shall immediately remove same and thereafter issue notices that the person concerned is liable for the cost of the removal and rehabilitation of the area, as outlined in the same by-law. In case the waste management officer has issued a compliance notice to anyone for contravening any provision of this By-law and such person fails to comply with such notice he or she shall be guilty of an offence.

The very same bi-law by the City of Cape Town (2009) indicates that waste management officer may in writing require any person to submit a report to him or her in respect of the impact of waste in a specified form as stipulated in the City's guidelines as published from time to time. If ever the person fails to submit such a report within the period specified, the waste management officer may appoint an independent person to compile the report and recover the costs of compiling the report from the person required to submit it, this is part of the same by-law.

2.2.3.2 City of Johannesburg Metropolitan Municipality

The City of Johannesburg By-law (2013) clearly explains that every owner and occupier of premises must keep those premises clean and free from any waste which is likely to cause a nuisance, harm to human health or damage to the environment, and the owner of the premise have got the duties that he/she must perform. In the very same by-law, it was stated that the owner in the case of privately owned land, must take reasonable steps to ensure that a sufficient number of approved receptacles are provided for the discarding of litter by the public, on any premises to which the public has access. In terms of the provision of the very same by law, no person may cause litter; sweep any waste into a gutter, onto a road reserve or onto any other public place; disturb anything in, or remove anything from any receptacle which has been placed for the purposes of collecting litter in such a manner as to cause any of the contents of the receptacle to spill from it. The owner in the case of privately owned land to which the public has access, must within a reasonable time after any litter has been discarded, dumped or left behind, remove such litter or cause it to be removed from the premises concerned to prevent the litter from becoming a nuisance, as alluded in the very same by-law.

The same by-law by the City of Johannesburg By-law (2013) states that any person, who contravenes or fails to comply with any provisions of these by-laws or fails to comply with any notice or order issued or condition imposed in terms of or for the purposes of these by-laws or fails to comply with any lawful instruction given in terms or for the purposes of these by-laws, or who obstructs or hinders any authorised representative or employee of the Council in the execution of his or her duties under these by-laws, is guilty of an offence. Then the very person is liable to a fine or in default of payment to imprisonment for a period not exceeding 6 months and in the case of a continuing offence, to a further fine not exceeding R50 or in default of payment, to imprisonment not exceeding one day for every day during the continuance of such offence after a written notice has been issued by the Council and served on the person concerned requiring the discontinuance of such offence.

2.2.3.3Ekurhuleni Metropolitan Municipality

Ekurhuleni Metropolitan Municipality (2001) no person shall throw, let fall, deposit, spill or in any other way discard, any refuse into or onto any public place, vacant erf, farm portion, stream or watercourse, other than into a refuse container provided for the purpose or onto a landfill site or

satellite station controlled by the Council. Furthermore from the very same by laws it was stated that no person is allowed to sweep any refuse into a gutter, on a road reserve or any other public place.

2.2.3.4uMhlathuze Municipality

The uMhlathuze Municipality (2013) states that no person may cause litter; sweep any waste into a gutter, onto a road reserve or onto any other public place; disturb anything in, or remove anything from any receptacle placed for the purpose of collecting litter in such a manner as to cause the contents of the receptacle to spill or fall onto the ground around it. Furthermore, the council, or the owner in the case of privately owned premises to which the public has access, must within a reasonable time after any litter has been discarded, dumped or left behind, remove such litter or cause it to be removed. The by-laws also indicate that a reasonable time may mean that period of time before the litter becomes a nuisance or cause for complaint.

2.3 Municipal Solid Waste Management in South Africa in Comparison with Developed Countries

Couth and Trois (2012) indicated that solid waste which is managed by municipalities is generally referred to as municipal solid waste. The study continues to explain that the types of wastes included in municipal solid waste vary significantly, but essentially comprise of materials, which can be recycled or composted.

Another study conducted by Nahman and Godgrey (2010) explicitly demonstrated that the extended producer's responsibility which gives the responsibility to the producers for every life cycle of the product. From the same study it was indicated that extended producer responsibility was originally put together and applied to the management of packaging waste in countries such as Sweden, Taiwan and Germany (the 1991 German Packaging Ordinance) in the late 1980s and early 1990s. The study further explains that the extended producer's responsibility is traditionally implemented through either mandatory or voluntary product take–back schemes. Mandatory take–back obligations require that manufacturers, importers, distributors and/or retailers take products back at the end of their useful life, usually in combination with a recovery or recycling target, as in Germany, Austria and Taiwan, however extended producer's responsibility schemes can be implemented voluntarily by

industry as in the Netherlands, Victoria (Australia) and the UK. In South Africa the concept of the extended producer's responsibility became more predominant during the inception of the waste act. With reference to the same initiative, South Africa through its National Environmental Management: Waste Act (DEA) 2008 (Act no 59 of 2008); it gives responsibility to the producers for the life cycle of a product. This has been done through the extended producer responsibility (EPR). In this case both South Africa and Germany continues to uphold the principle of extended producer responsibility.

Another interesting point of focus is the waste management hierarchy which both the South African and European countries continue to uphold. The National Environmental Management: Waste Act (DEA) 2008 (Act no 59 of 2008) is central around the waste management hierarchy as a way to manage waste management in South Africa. Similar findings have been established in a study conducted by Pires *et al*. (2011) which indicated that current European regulations promoting the hierarchy of waste management inevitably involve a wealth of waste management practices tied to policies, institutional settings, financial mechanisms, technology selection, and stakeholder participation.

The development of plans has been seen as a way to uphold the acceptable waste management measures in the Republic of South Africa as well as in Ireland. The National Environmental Management: Waste Act (DEA) 2008 (Act no. 59 of 2008) explicitly shows that each municipality should develop the Integrated Waste Management Plan, in it there must be a reflection of how the waste management will be carried out in the municipal jurisdiction area. It also pin points at how the current situation of waste management is in that particular area, and coming with the strategies for the better waste management in that particular municipality. The Waste Management Act (1996) gives the powers to the Minister for the Environment and Local Government with responsibility for waste management and it also required local authorities to prepare waste management plans. In the very same way as the South African plans, the Ireland plans address all aspects of the prevention, minimization, collection, recovery and disposal of general waste. The plans of these countries are reviewed every five years. This clearly demonstrates the uniformity in some of the waste management strategies in South Africa with the Ireland counterparts.

Notably, the waste management service has very high waste management implications. South African government, the funding is primarily from the tariffs that are charged monthly for the waste management activities. Wagner and Arnold (2008) the primary funding sources for the municipal solid waste in Nova Scotia are municipal property taxes and tipping fees. It should therefore be noted that the Nova Scotia is a place which is located at Canada which is the developed country. Furthermore the study indicates that the supplemental funding source is provided through RRFB Nova Scotia's beverage container deposit system. This system included a two differential deposit and refund rate based on container size and use, the study indicated. The study also reveals that with the exception of domestic beer bottles (which return 100 percent of the 10-centdeposit), consumers pay 10 cents on non-dairy beverage containers of 500 mL and below and receive 5 cents back when the containers are returned to any of the 83 independently run ENVIRO-DEPOTs_ throughout the province. However the alcoholic beverages in bottles above 500 mL have a deposit of 20 cents with 10 cents returned, the study indicated. The very same study indicates that from 5 cents that remains from the 10-cent deposit, a handling fee of 3.56 cents per container is paid to the ENVIRO-DEPOT_. This fee was expected to increase to 3.63 cents on April 1, 2007. The remaining 1.44 cents according to the findings of the study is used to fund municipal solid waste programs, the four regional material processing centers, transportation of diverted materials, and administration of the fund (the 20-cent deposit double these returns). The very same study indicates that in addition to the 10 percent of RRFB Nova Scotia's net revenue funds Nova Scotia Department of Environment and Labor's (NSEL) Solid Waste-Resource Management office to assist with enforcement, policy, legislation, and staffing.

Continuing on the aspect of funding, Wagner and Arnold (2008) unveiled more sources of funding which is through levying ''environmental'' fees on certain items, including tires, paint, and milk cartons. It should be noted that these fees are self-imposed by the industry, which have been established through stewardship agreements, discussed below. The same study indicates that the already used tires, the nemesis of municipal solid waste managers worldwide, are banned from disposal in Nova Scotia landfills. To instill the collection, and to reduce illegal disposal, Nova Scotia tire retailers levy a one-time environmental fee of $3 per passenger tire and $9 per truck tire at the point of sale with used tires returnable free of charge to any of the province's 900 tire retailers, the study indicates. These fees are remitted to the RRFB Nova Scotia to support area tire recycling

programs, the study shows. Moreover, the study records that since 1997, 6.1 million used tires have been collected and in 2005, 805,000 tires were collected representing a 72.4 percent recovery rate and $3.2 million collected by the RRFB Nova Scotia. This clearly demonstrates the diversity of funding which Nova Scotia has to supplement the waste management activities. South Africa is fortunate that the Integrated Waste Management Plan (IWMP) is incorporated within the Integrated Development Plan, so that funding would be allocated to it, but waste management activities can be able to sustain itself through the tariffs.

Like the case of South Africa, Cristina and Matete (2008) conducted a study in India as one of the developing country and the collection, transportation and disposal of the municipal waste are unscientific and chaotic. The study further indicates that there are limited initiative of recycling and recovery of waste. The same study indicates that South Africa is facing the challenge of meeting the standards in service delivery with limited resources in place. The inequality and differences in services between different communities in the same area is a characteristic of waste management in South Africa.

2. 4 Methodological Approaches in Studies of Municipal Solid Waste

2.4.1 Questionnaires and Surveys

The study conducted by Nahman and Godfrey (2010) used the semi-structured questionnaires and face to face interviews. These tools were used to acquire the information from the municipalities and the private waste management companies. The study focused on the economic instruments for solid waste management in South Africa. Using the very same methods, 18 individuals from 13 municipalities and two private companies were sampled. As a result of this study ninety three percent of the municipalities that were interviewed provide the communal waste collection services. Furthermore, 93% of these municipalities provide the waste collection services commercially. It is also indicated that landfills are operated by most of the municipalities (87%), and some by private contractors. Using the questionnaire tool it was established that 7% of the municipalities and companies do not charge for waste collection services at all, 13% use fixed rates. To establish the economic tools in waste management, the questionnaire and face-to face interviews were used. Some

of the questions which were asked in this questionnaire were central on the issue of the waste management status quo and municipal solid waste management services.

Another study used the questionnaire as a tool in trying to establish the cost for transferring the municipalities to waste separation at source. This study was carried out by Lavee and Nardiya (2013) and they used questionnaires to reach their desired goal. The questionnaire was distributed for data collection of the general information regarding waste ratio and separation at source. This very questionnaire was therefore sent to all the municipalities in Israel. The content of the questionnaire included the demographics, quantity of waste and the systems that are required for separation of waste at source. This eventually yielded the positive outcome as desired.

Al-Khatib *et al*. (2009) used questionnaires to establish variety of matters with regards to littering in particular. In establishing if gender has an effect on littering, then the questionnaire was developed and some of the questions under gender were on whether one litter on streets, or not, which type of litter you throw on the streets and the method which can be used to stop littering? In this very questionnaire answers were structured, and the respondents were given the opportunity to choose one of the options. The question were on which of the following types of waste do you litter, which is the driving cause of litter, would you be willing to participate in street cleaning campaign, who is responsible for street cleaning? This very questionnaire has led to the view of the use of the integrated approach in addressing the littering crisis. The questionnaire is very effective because it ensures explores the will of the community with regards to waste management, and the problems encountered thereof. The same study indicates that gender, income, and marital status profile of the respondents are correlated to their littering practices, it has therefore been established as indicated above that the multiple approach is needed in addressing the issue of littering in the Palestine territory.

In another study conducted by Purcell and Magette (2010) face-to-face interviewing survey was conducted and this was chosen with the hope of swift responses as compared to the low rate of responses when it comes to the surveys that reach the respondents by post. Face-to-face are better suited because they are personal and better suited as a primary method of surveying.

2.4.2 Life Cycle Assessment

Busto *et al.,* (2012) studied the Life Cycle Assessment of the solid waste management. The life cycle assessment which has been applied to sustainable municipal solid waste management has quickly enlarged over the few years as a tool that is able to capture and handle complicated and interdependencies typically characterising modern integrated waste management systems. The study also shows that the integrated waste management systems should be analysed as a whole, since they are interrelated with each other and developments in one area frequently affect practices or activities in another area. The Lice Cycle Assessment is mostly used to rationalise technological choices and management strategies, while less advanced regions Life Cycle Assessment is utilised to develop measures to implement more integrated solid waste management in Europe in particular. It should therefore be noted that the Life Cycle Assessment methodology and waste management related tools are rapidly expanding, there are still a form of uncertainties and open issues, which are challenging the scientific community and that are limiting the diffusion among the end users. The study indicates the importance of showing how to understand what the Life Cycle Assessment has the ability to do to the local authorities and the operators. It should therefore be noted that the issue of waste management lies primarily on the local authorities and the operators on the ground, so there is a vast need for these areas to be prioritised. The study further indicate that the Life Cycle Assessment has the potential to supply objective and comprehensive information, but, in Italy and elsewhere, the final decision lies primarily with the public administrators who are aware of the potential of the Life Cycle Assessment. The study also indicates that the public administrators often set up the priorities and take decisions which are focused on the financial constraints rather than the environmental optimisation issues.

Still on the very study by Busto *et al.* (2012) Life Cycle Assessments of the complex and interdependent systems such as the waste management shows complexity which is influenced by site-specific factors, non-technical and local socio-economic constraints. Non-experts will find very difficult to come up with the Life Cycle Assessment, as the very same study outlines. It was again elaborated from that the outcomes of the Local Cycle Assessment applied in the integrated waste management systems are unique and should never be generalised though a lesson learned. The very same study indicates that for the proper development of the Life Cycle Assessment two integrated

Life Cycle assessment should be developed, which are: 1. Goal and scope must be clearly identified, defined and justified, 2 both the input data and inventory results must be fully made available and it should be possible that the mathematically manipulate them.

2.4.3 Measurements

The study conducted by Al-Khatib *et al*. (2010) used measurements as one of the ways to achieve the objectives of the research in question. In this study the scale was used to weigh the dustbins which were at the various sampling sites. Al-Khatib *et al*. (2010) indicated that the density and percentage of the components of the solid waste, and the total sample weight and destiny of the whole sample were computed. The distance in which the community is willing to go dispose the waste in the bin was measured. In these measurements the community indicated that they are willing to walk for a distance of about 10- 20m (Al-Khatib *et al*. 2010).

2.5 Factors affecting littering

There are various factors that have an influence on littering (Al-Khatib *et al*. 2009; Cierjacks *et al*., 2012 and Al- Khatib *et al.* 2007) and some of them are explained in detail below:

a) Social functions

It has been proven beyond reasonable doubt that the social functions like festivals have high probabilities of producing high level of waste through littering. It is common knowledge that in events such as these of festivals, majority of people are seen drinking and eating take-away thereby leading to littering. In a study by Cierjacks *et al.* (2012), it was found that the residual litter was significantly lower in the entrance and rest zones than in stage, food, and camping zones. The path and sanitation zones showed intermediate values and did not show clear differences. Both littering and littering per person were significantly higher during the event and the departure phases than during the arrival phase. The high influence consumption is influenced by the availability of beer in these events. It is therefore suggested that the availability of more transparent bins and labels might yield a minimal littering hence environmental consideration (Cierjacks *et al*. 2012).

b) Gender

The study conducted by Al-Khatib *et al*. (2009) explicitly indicated the highest percentage (28.2%) of responses by male interviewees regarding throwing litter on streets was ‘‘only when there is no nearby litter can”, while for females, the highest percentage (41.3%) answer was ‘‘never”. The percentage of females who claimed to never litter (41%) was almost double that for males (22%). Similarly, more males (21%) than females (17%) admitted to littering ‘‘most of the time”. This therefore clearly indicates that the males litter more commonly than the female. It is also indicated that more males smoke and throw the cigarette butts than the females. This shows that more focus should be given to the males as they have been found to be the most common people who litters. This study was done in Nablus-Palestine (Al-Khatib *et al*. 2009) and could be an indication of the general behaviour among men.

c) Marital Status

From the similar study conducted by Al-Khatib *et al*. (2009) the married and widow(er) respondents had a common response to the question ‘‘do you throw litter in the streets?” and the answer was ‘‘never”, while for single and divorced respondents the most common answer to the same question was ‘‘for absolute necessity”. According to the study conducted by Herberlein (1971) it was therefore established that the married individuals litter less than single ones. It have been indicated within this very study that the majority of all groups have responded positively to the question ‘‘Would you be willing to volunteer in a public street cleaning campaign?”, although the agreement percentage was lower among the single and widow(er) respondents, compared to the married and divorced respondent groups. Therefore as a result 44– 64% of the people surveyed claimed to be willing to participate in such a campaign. It is also interesting to see that widow(er)s are more determined in their stand regarding this issue, where only 11% of the widow(er) interviewees responded with ‘‘not sure”, compared to 31% of single respondents. Furthermore, widow(er)s (who are, more commonly, at an advanced age) and married individuals are expected to be at a higher level of social maturity and stability, which will reduce their tendency to litter (Al-Khatib *et al.* 2009).

d) Monthly Income

The level of income that people receive has an influence on littering. From the study conducted in the Palestinian community by Al-Khatib *et al*. (2009) the monthly income groups of (1001– 2000 NIS), (2001–4000 NIS), and (more than 4000 NIS) had the most common response to the question ‘‘Do you throw litter in the streets?” was ‘‘for absolute necessity”, while in the monthly income group of (0–1000 NIS) the most common answer to the same question was ‘‘never”. From this study one can therefore conclude that low earners have less tendency of littering as compared to high earners. Therefore it will be very appropriate that the focused be fully directed to the high earners first as they are the ones that are central to littering problem, as the study suggests. However this is contradicting to common knowledge that high earners would litter less because they are most educated. This finding could be study specific and might not be generalised.

Furthermore, the interviewees with family income of (1001–2000 NIS) and (more than 4000 NIS), the two most effective factors that help in preventing street littering are ‘‘increasing moral and religious convictions” followed by ‘‘the increased availability of litter cans”. Moreover, the interviewees with monthly income of (0–1000 NIS) and (2001–4000 NIS), the same two factors were also placed as the most effective with their level of importance reversed.

In the very same study by Al- Khatib *et al.* (2009) there was a common agreement among all respondents of all income levels that street cleanness is a shared responsibility of the citizens and the local authorities. It should be indicated that the respondent groups with the lowest monthly income (0– 1000 NIS) and the highest monthly income (more than 4000 NIS) contained the highest percentage of respondents who believe that street cleanness is the responsibility of the local municipalities alone. This therefore clearly shows the influence income has on littering.

e) Religious Convictions

From the very study conducted by Al-Khatib *et al*. (2009), it was discovered that the ‘‘cigarette butts” litter was the highest among the respondents with a low religious level, ‘‘glass bottles” litter was the highest among interviewees with a medium religious level, while littered food was the most common among people with high religious level. These findings may be linked to Muslims beliefs

(Al-Khatib *et al*. 2009). This therefore explains why a low percentage of interviewees who identified themselves as having strong religious convictions indicated that they litter less of cigarette butts, whereas food waste was the most common litter item for the same group. But within the Palestinian community which has a high percentage of smokers (among males in particular), it is interesting to see that cigarette butts and glass bottles were the most common among respondents with low and medium levels of religious convictions. Furthermore within the very study by Al- Khatib *et al*. (2009) there was a general agreement among respondents, with various levels of religious convictions, that the main leading reason for street littering was the ‘‘insufficient availability of litter cans”. Moreover, second leading reason for street littering was the ‘‘dirtiness of the streets” for respondents with medium and high levels of religious convictions, compared to ‘‘laziness”, as reported by respondents with a low level of religious convictions. There was a positive attitude among most interviewees towards participating as volunteers in public campaigns for street cleaning. The people unwilling to participate in such campaign were highest (41%) among respondents with a low level of religious convictions, and lowest (15%) among interviewees who identified themselves as highly religious. It could therefore be concluded that religious convictions contribute to a better acceptance of the concept of volunteerism as a common good practice. This therefore emphasizes the importance of incorporating litter prevention as a topic in religious education (which is a mandatory topic in the Palestinian curriculum for Muslim students in public schools) (Al-Khatib *et al*. 2009). Furthermore, street cleanness was agreed by the majority of interviewees with medium and high levels of religious convictions to be a joint responsibility of both the citizens and the local municipalities, while the majority of interviewees with a low level of religious convictions mentioned that street cleanness is the responsibility of the local municipalities only. Therefore, these observations reveal a unique character of Middle Eastern communities. The study carried out by Al-Khatib (2009) indicated that 29.6% of the children cited that moral and religious conviction as the most effective techniques to prevent children from throwing glass litter. This again highlights the need to introduce environmental education in church programs. South Africa is mostly a Christian nation and it will be interesting to compare the results with the Middle Eastern communities.

f) Unavailability of Bins and Street Dirtiness

In the study that was conducted by Al-Khatib (2009) the street dirtiness and unavailability of bins were therefore cited as the common causes of street littering. From this very study, dirtiness of streets was cited as the main cause of littering by 27.1% of the respondents who admitted to littering. The secondly cause was insufficient availability of garbage bins (or other disposal options), which 24.6% of the children cited as their excuse for littering. This is to say there is an absence of disposal options in the streets of most non-central municipalities. These findings emphasize the importance of increasing the number of litter bins in streets and public places. Therefore this should be addressed by local authorities (through the municipalities and village councils) as an effective measure to discourage people from littering, in addition to improving street cleanliness, regularly emptying the bins, and engaging the public in street cleaning campaigns.

The study conducted by Al- Khatib *et al.* (2007) also proved that unavailability of the bins could be one of the impediments in the fight against littering. However in this very study it was therefore established that many people litter based on insufficient garbage bins, with 56 % of the respondents having littered due to unavailability of receptacles. In this very same study the respondents mentioned dirtiness of the streets as the rationale for them to litter. As a result 20% agreed to the dirtiness of the streets as the cause of littering, thereby being the second factor that causes street littering.

g) Education

The highest percentages of illiterate interviewed in regard to throwing the litter on street, have indicated that they have never thrown the litter on the street, and the same response was recorded for elementary and secondary education. 'Absolute necessity' was the response of those who have completed their tertiary level, for the same question. There has been a relationship between the type of litter dumped, and the education background. 'Food waste' has been very common to the illiterate, and 'bottles' to the elementary, secondary and university interviewee. The cigarette butts were the types of litter common for the postgraduates. In terms of participating on public street cleaning campaign, all the groups agreed, except the illiterates. All the groups agreed that both the citizens and municipality are responsible for street cleanness (Al- Khatib *et al.* 2007).

Then Ferreira *et al.* (2006) indicated that education is a backbone in the quest for sustainability. However it should therefore be noted that there is an illusion that education will solve all our sustainability problems in the future, leading us single-handedly into the desired sustainable society. From the very same study by (Ferreira *et al.* 2006) it was illustrated that in the absence of education, we will hardly achieve the transition to sustainability, if we do not, at the same time, do everything we can to transform our political, economic and social systems into more sustainable structures. Therefore education plays a very important role in proper in good management. According to the very same study education prepares the people for the responsible adulthood. However, it should be noted that education does not easily change deep rooted bad attitudes towards littering some embedded into culture and sustained efforts need to be implemented to uproot this behavior. This is often true because one finds medical doctors who smoke but knowing the bad side of it.

h) Types of Residence

It is commonly understood that the people staying in the same area tend to have similar culture and ways of doing things. From the study conducted by Al- Khatib *et al.* (2007) the people staying in the refugee camp attested to the fact that they litter for 'absolute necessity' (31%) and 29% for the question of 'only if there is no nearby bin'. For the other residential areas like the city centre, suburbs and villages answered 'never' and 'absolute necessity' for both questions. This shows the influence of the place of residence to littering practices. Also the type of residential area could be related to education and income.

i) Age

In line with the findings attained from the study conducted by Al- Khatib *et al.* (2007) the ages of 15-20, 31-50 and above 50 years have answered the most common answer to the question of ' do you throw litter in street' and the answer were 'never', and age 21-30 years responded 'for absolute necessity'. Furthermore in the very same study, 11% of the people older than 50 years old admitted to 'mostly' throw litter on the street. As of the type of waste littered, the people aged 12-14 and 14-20 years old agreed to litter bottles, 21-30 years was cigarette butts and bottles, 31-50 and 50 years and above was cigarette butts. Food wastes were seen as the second or third litters by all groups, in this very study. The results indicating that older 50 years throw litter on the street (11%) is surprising

because they supposed to be the most responsible. There is a great prospect that other factors could have been involved. The results from the influence of age for the study may not be easily be generalised.

For South Africa, environmental education is incorporated in primary school education. In major cities, recycling bins for different types of waste are present at primary school premises. This encourages pupils to practice what they learn. In tertiary education they mount bins for different types of waste for sorting. This should therefore encourage the young people to stop littering, because of the availability of the waste receptacles. It is family and church support needed, since charity begins at home.

2.5 Solutions to Littering Behaviour amongst People

As inscribed on Salhofer (2007) waste prevention has been regarded as the highest priority under European waste management law, however, the strategies initiated so far have not reduced the regular annual increase in total waste arising across Europe. According to the very same study the initial step to reach waste prevention targets focused on the weight or, for example in the case of lightweight packaging, on the volume of the generated waste; i.e., on quantitative waste prevention (reduction in the amount of generated waste). It has been stated again that because the environmental effects of waste depend not only on the quantity but also on the composition of the generated waste, qualitative waste prevention (reduction in the hazardousness of waste generated) was soon also included in waste management targets. In this very same study it was indicated that waste prevention covers different options such as stopping the production of certain goods, substitution for one product by another, or extending the utilization phase for items, there is no general method which can be applied to evaluate the effectiveness of different specific measures. The producer's responsibility can also have an influence on ensuring that the environment is clean. Srivastava *et al*. (2005) indicated that effective and scientific municipal solid waste management (MSWM), which includes prevention and reduction of waste, is necessary for sustainable urbanization and development. It has been stated that if ever the population and resources are not accompanied by the development of innovative approaches for availing enhanced community participation and government support for environmental management, it may lead to deterioration of environmental quality and social

conflicts. It has been stated in the very same study that municipal waste management in India have shown that the higher the average income of the people, the higher is their per capita waste generation. This actually implies that in trying to ensure a clean environment, and then there is a need for priority to be given to the high earners. The same study indicates that due to improper solid waste disposal and management, there is an urgent need to initiate a well-planned integrated municipal waste management approach with the community to participate in the city. With regards to Chen *et al*. (2010) the regulatory and financial aspects of municipal solid waste management have received the prime and most attention to date, the following three aspects must be further addressed to achieve a more integrated approach to municipal solid waste management: (1) system status, to better investigate and monitor the status of the waste management system; (2) dynamics within the system, to coordinate stakeholders and to build partnerships among them; and (3) dynamics between the system and the environment, to plan the municipal solid waste management system with consideration of local conditions. As stated in the very same study, not only one approach is going to address the issue of municipal solid waste management, however an integrated approach is required. Some of the possible solutions to littering, mostly from the discussion above are explicitly outlined and in details.

2.5.1 Moral and Religious Conviction

In accordance to the study conducted by Al- Khatib *et al*. (2009) the vast majority of the interviewee had a common ground that the factors that might lead to the decline in littering is moral and religious convictions. This is supported by the fact that Islamic religion is very common in the Palestinian community. Like other religions, the Islamic religion places more emphasis on cleanliness to such an extent that it considers the removal of dirt from streets as an act of worship and obedience, therefore the role of the religion becomes of significance. The Christian religion emphasizes the issue of people upholding cleanliness and accountability at all costs. In the very same study it was also elaborated and deliberated that the anti-littering campaigns should also be extended to the religious congregations and ceremonies to further convey the message of abstinence from the attitude and behaviour of littering. This will therefore encourage and incite even the remaining portion of the religious convicts that were a bit reluctant to uphold this principle of cleanliness. A special focus should be geared to promote moral convictions among the residents, because the littering practice

was found to be predominant within the residence with low moral and religious convictions. The study has articulated that majority of the people would rather abstain from littering due to moral and religious commitments than public awareness campaigns. In the very same study by Al- Khatib *et al*. (2009) the positive correlation between the religious convictions and the willingness to partake or volunteer in public cleaning campaign as it is the shared responsibility.

Therefore, the most fundamental principle in dealing with the issue of littering is through ensuring that the moral and religious conviction to the community. This could be done through open engagement with the community, thereby giving them the most appropriate reason for them to engage and commit in religious practices. It is therefore understood that the increase in moral and religious convictions will therefore ensure that there will be moral regeneration in regard to cleanliness, *inter alia*. The issue around the societal importance of the moral regeneration has been evident all along. When somebody behaves in a very strange manner, people always question the moral and religious status of that very individual. This therefore confirms the principle of enhancing the moral and religious status of a community in trying to deal with the waste management issues, littering in particular. For South Africans, most of the academics who research on issues related to littering and waste management in general should give seminars and presentations in churches.

2.5.2 Increasing the availability of Litter Cans

Al- Khatib *et al.* (2009) the community has demonstrated their dissatisfaction by the unavailability of the litter disposal facilities in public spaces. The very study shows that this has been one of the major causes of littering. It is evident that people do walk or drive while eating and after they have finished eating, they need to dispose of the litter in question, and as a result they find no waste receptacle. This has been one of the major reasons as to why people litter. The very same study has again stated that the primary role in ensuring that the littering crisis is dealt with it once and for all is for the local government to ensure that the litter receptacles are available and transparent.

In the study conducted by Al- Khatib (2009) the children interviewed mentioned unavailability of garbage bin as the second factor that contributes to littering crisis. The children injuries by bottles have also been attributed to the littering crisis. Therefore if the waste receptacles can be increased then this will therefore curb all the litter related injuries, as the very same study has clearly indicated.

From the study executed by Al- Khatib *et al.* (2007) agreed that the increase in garbage cans could serve as a solution to street littering. As clearly indicated from the very same studies, moral and religious convictions together with the availability of bins have been seen central to resolving the litter crisis. Therefore, there is a need for an integrated approach in dealing with the littering crisis, as per findings on the very same study. Also in major cities like Johannesburg and other similar cities where public transport is not efficient, people wake up early and leave for work much earlier. In some instances people eat their breakfast in cars. Therefore this very people should be encouraged not toi throw litter through the windows.

2.5.3 Improve the Street Cleanliness

The study conducted by Al- Khatib *et al.* (2009) shows that dirtiness of the streets has been the major factor enhancing littering. People tend to behave in accordance to the standard behaviour in a particular area. In cases wherein there is an evidence of littering, people usually sustain that very tendency and this becomes a way of life. The clean environment will always create the expectation of cleanliness in a particular area, *vice versa.* Cleanliness of the environment and public places in particular can reduce littering. In many South African municipalities there are little regular litter cleaners who try to keep the cities and towns clean. The enormous crisis is predominant in congested cities because it is not easy to clean as littering rate is much higher as compared to less congested cities.

2.5.4 Public Awareness Campaign

In accordance to the study conducted by Al- Khatib *et al.* (2007) the anti-litter awareness campaign will do well in terms of reducing litter in public places. This very study shows only 5% of the respondents agreeing to this factor as the factor likely to reduce litter. Sekito *et al.* (2013) revealed that the implementation of community-based waste management has positive effects on waste discharge behavior. From the very same study by Al- Khatib *et al.* (2007) it was further unveiled that there were no residents disposing their waste on the side of the road, into river streams or burning their waste illegally where community-based waste management was already implemented. In the very same study it was concluded that that community-based waste management reduces inappropriate waste disposal behaviour and in turn contributes to environmental improvement. It was

further indicated that the future study should be designed to investigate the relationship between the implementation of community-based waste management and environmental cleanliness in the area. Education has been a factor to influence the participation of people on waste management. Public awareness campaigns must therefore be encouraged as they force people to change their littering behaviour.

2.5.5 The Anti-litterbugs Campaign Model

The study conducted by Hing and Gunggut (2012) clearly shows that the anti-litterbugs campaign is an integrated and systematic approach which has been developed to reduce littering and promote urban cleanliness. It has been designed as a combination of awareness campaign and enforcement. This in actual sense it means that people must be actually taught how the system works and if ever people are not willing to comply, then the form of enforcement should be upheld because now people are aware of the procedure. In the very same study, it was uncovered that education is the core instrument to transform the environmental behaviour as well as facilitating change through infrastructural support, such as the provision of rubbish bins. This study clearly shows the importance of verbal communication than placing a sign only. Therefore the more people talk about littering the more they are embarrassed to litter than just seeing the sign placed somewhere. It was also established in this very study that this approach is unlike the conventional approach of targeting rubbish, the anti-litterbugs targets the root cause of the problem. The study also shows that this approach has many different components which are: litter free premise, litter free events, travel announcement, banners and streamers, road shows, table talk, report littering from vehicle, anti-litter ambassador, continuous enforcement, etc. It is also indicated that the campaign is very clear, it targets the litterbugs or people who throw rubbish on the indiscriminately. This approach as stated in the very same study, it emphasises on catchphrase like “Beware, you are being watched” to pass the message that they are being targeted.

2.5.6 Enforcement

Hing and Gunggut (2012) demonstrate that lack of enforcement has been identified as one of the reasons for widespread littering, which in turn contributes to the lack of cleanliness in urban areas. In the very same study it was uncovered that since one of the driving forces of the Anti-Litterbugs

Campaign is enforcement, the campaign devises strategies to make enforcement easy through ensuring that the campaign is well known to people as possible. Therefore this is accomplished through various means, such as by displaying simple and easily understood straight forward anti-littering messages in banners and streamers, making announcements from moving vehicles, announcements at shopping complexes, road shows and exhibitions. It was established that if ever many people are already aware of a campaign, they have no more excuse for littering, and they cannot argue with the enforcement officers any more. Furthermore in the very same study by Hing and Gunggut (2012), it was observed that this time the activity is not picking up rubbish but nabbing those who throw rubbish indiscriminately. It was found out that those who pay heavy price are those organisers of the events who gain immediate revenue from payment of fines. It was realised from the same study that those people who are caught littering are embarrassed for being nabbed and fined for littering consequently, this serves to educate participants against littering. Then due to availability of the presence of so many participants, the litterbugs would not bother arguing, but rather pay the fines and walk off immediately, this certainly makes enforcement easy. The study shows that another strategy is to make payment of fines easy, and this can be done by enabling litterbugs to pay their fines on the spot, with receipts issued to them for every payments made. This therefore saves them the task of having to go to the local authority office to pay the fines.

2.5.6 Public Participation / Whistle Blowing

In accordance to Hing and Gunggut (2012) littering from vehicles can be abated through voluntary reporting of the perpetrators to the authorities. In the very same study its shown that the members of the public who witness such incident are encouraged to report the registration number of the vehicle involved to Kota Kinabalu City Hall (Malaysia). Reporting is important because the perpetrator doesn’t only check out if the officials are present but every person becomes the officer. It is also indicated from the study that when the City Hall receives a report on such incident, the City Hall writes a letter to the owner of the vehicle, bringing to his or her attention the act committed either by the driver or passenger of the vehicle concerned, not necessarily the actual owner of such vehicle.

Chapter 3: Research Design and Methodology

This research constitutes both the qualitative and quantitative methods of data collection and analysis. According to De Vos *et al*. (2005) the quantitative data-collection methods mostly employ measuring instruments.

3.1Study and the Sampling Area

This study was carried out in the capital city of the Republic of South Africa, Pretoria. Pretoria is under City of Tshwane Metropolitan Municipality. The results of census (STATSSA 2011) indicated that City of Tshwane Metropolitan Municipality has a population of 2 921 488. Census (STATSSA 2011) also indicated that the population growth of this municipality was at 3, 10% per annum from the year 2001 to 2011. From the same population, Census (STATSSA 2011) indicated that the highest population cluster was between the age of 15-64 (71, 9%) followed by those of less than 15 years (23, 2%) and lastly those older than 65 years (4, 4%). Census (STATSSA 2011) also found that the sex ratio of males per 100 females was 99 in Tshwane metropolitan municipality. The census 2011 continued to show that 4, 2 % of the total population (excluding those that are under the age of 20) of the City of Tshwane Metropolitan Municipality have no schooling background, followed by 34, 5 % of those who had matric and lastly 23% had higher education. However, the sampling areas were from Pretoria Central Business District (CBD), Garsfontein (Eastern part of Pretoria) and Marabastad. The sample size for each was 150.

Table 1: Surveyed sample distribution (numbers and percentages) based on gender, marital status, religious commitment, monthly income, age, place of residence and educational background.

Independent group	Number of respondents (numbers in parentheses)	Total
Gender		
Male	201 (45)	450 (100%)
Female	249 (55)	
Marital status		
Never married	199 (44)	450 (100%)
Married	42 (9)	
Divorced	209 (46)	
Religious commitment		
Never committed	180 (40)	450 (100%)
Partially committed	130 (29)	
Highly committed	140 (31)	
Monthly income (in Rands)		
0-7500	100 (22)	450 (100%)
7500-15000	140 (31)	

>15000	210 (47)	
Place of Residence Pretoria central Business District Garsfontein Marabastad	 150 (33) 150 (33) 150 (33)	450 (100%)
Age (in years) 0-17 18-35 36 and above	 3 (0) 250 (56) 197 (44)	450 (100%)
Educational Background Never attended Grade R-7 Grade 8-12 Tertiary level	 215 (48) 1 (0) 2 (0) 232 (52)	450 (100%)

Around 45% were males and 40 % were females. In terms of the religious commitment, the highest respondents were the never committed (40%), followed by highly committed (31% and followed by partially committed (29%). When it comes to marital status, the highest group of respondents were the divorced (46%) followed by the never married (44%) and lastly the married (9%). In terms of the level of income, the highest percentage were those that earn more (47%), followed by the middle earners (31%) and lastly the low earners (22%). Focusing on place of residence, all sampled areas Pretoria Central Business District, Garsfontein (Eastern part of Pretoria) and Marabastad) had 33%. The highest percentage on the age category was 18-35 (56%), followed by >35 (44%) and lastly was age 0-17 (0%). Lastly, the highest percentage when it comes to the educational background were those who studied up until tertiary level (52%) followed by never attended (48%) and finally both those that were in grade7-12 (0%).

In the section below, the impacts and implications of the biographic and religious factors are discussed in details.

3.2 Data Collection Methods

3.2.1 Questionnaires

Questionnaires refer to a designed set of questions in a form which is completed by a respondent in respect of the research problem in question (Barker 1995 as cited by De Vos *et al.* 2005). The questionnaires were developed, and it was generic to all the areas of study as mentioned. The questionnaire was designed in a way that it captures the biographic factors assumed to be influencing littering. Detailed questionnaire is shown on appendices. It should be noted that 150 of the

questionnaires were administered to each area of study, which is Garsfontein, Marabastad and Pretoria Central Business District (CBD), therefore the total amount of the respondents were 450. The questionnaire administering was done with the help of a friend for security reasons and respondents were first briefed about the intention of the study and then asked to fill the questionnaire. Thereafter the form was collected. The respondents were also asked to sign the consent form before filling the questionnaire.

3.1.2 Visual Inspections

The visual inspection was also done to see the behaviour of people towards littering in the chosen study areas. The presence of waste receptacles and the frequency of collection were central to this exercise. The other investigation was to assess if whether the waste receptacles are correctly labelled and whether there was separation at source or not.

Chapter 4: Results and Discussion

4.1 Factors Affecting Littering in the Study Area

4.1.1 Gender

Table 1 below shows the different responses from males and females, looking at five different questions which are based on littering. The questions are: Do you litter on streets, which litter constitutes most of your litter, which of the following can stop people from littering, who do you think is responsible for street cleanliness and if public cleaning had to be conducted would you participate? The responses of both males and females are outlined on the table below:

Table 2: Effect of Gender on Littering

Question	Answer	Percentage of Respondents (%)	
		Males	Females
1. Do you litter on streets?	Never	48	52
	When there is no bin	38	62
	Sometimes	48	52
	Mostly	48	52
2. Which litter constitute most of your littering?	Paper	47	53
	Bottles	81	19
	Cigarette butts	69	31
	Food packages	34	66
3. Which of the following can stop people from littering?	Moral & religious convictions	48	52
	Better street cleanliness	53	47
	Public awareness	19	81
	Availability of rubbish bins	41	59
	Nothing	100	0
	Fines/Penalties	46	54
4. Who do you think is responsible for street cleanliness?	Citizens	48	52
	Municipality	52	48
	Both citizens & the municipality	39	61
5. If public cleaning had to be conducted, would you participate?	Yes	47	53
	Never	42	58
	Maybe	17	83
	If I have nothing to do	60	40

a) Gender and littering on streets

In reference to Table 2 above, the question that says: "do you litter on streets?" had three options which were "never, when there is no bin, sometimes and mostly". To all the answers the females came to be the highest in terms of the percentages. However, in most cases the percentages are very

close to each other. This means that it may not be easy to continue on the influence of gender on street littering. Gender seems to have no influence on littering from the population group in the study area. However in a similar study conducted by Al- Khatib *et al.,* (2009) the percentages were not close to each other and gender was seen to be a very big factor influence to littering.

b) Which litter constitutes most of your littering?

Table 2 above, clearly shows that the highest percentage of responses by males regarding what constitutes most of your litter was bottles (81%), meaning that the most littering constituency by male respondents were bottles and food packages for females (66%). The highest percentage of those who litter paper is females (53%) as compared to (47%) of the males. Then with bottles, the highest percentage was that of males (81%) as compared to females (19%). The highest percentages of those respondents that litter cigarette butts were males (69%) as compared to females (31%). When it comes to food packages the female respondents littered more (66%) as compared to males (66%). Therefore females litter more food packages and with males' bottles topping the list. Therefore gender has influence on the type of waste they litter. Men littering mostly bottles might be attributed and linked to drinking alcohol. Men smoke in the study area and in South Africa in general than women. However from the study carried out by Al- Khatib *et al.* (2009) the highest percentage of male respondents indicated that they litter "only when there is no bin" and for the female respondents was "never". In this study by Al- Khatib *et al.* (2009) women clearly showed more responsibility as compared to this current study.

c)Which of the following can stop people from littering?

In reference to Table 2 above, from the male respondents, the highest percentage (100%) from the question that says "which of the following can stop people from littering?" was "nothing" is going to stop people from littering. This may suggest that men are a problem group as compared to women. Then with the female respondents, the highest score was public awareness (81%). This emphasises the need for public awareness. On the very same question, those respondents who had the highest respondents from the answer "moral and religious convictions" as a factor that can stop littering were females (52%) as compared to the males (48%). The highest respondents on the answer of "better street cleanliness" as a solution to littering were from males (53%) as compared to females (47%).

This actually means that males belief that if the streets can be clean, then littering can be resolved, because people litter because the area is not clean. On the answer of public cleanliness as a solution to littering, females (81%) had more responses as compared to males (19%). More percentages of the female (41%) respondents believe that availability of bins can stop people from littering as compared to males (59%). The highest percentages of the female respondents (54%) believe that fines/ penalties can stop people from littering as compared to males (46%). By looking at the study conducted by Al- Khatib *et al.* (2009) the female and male respondents indicated that "increasing moral and religious convictions" can prevent littering. The males from the current study have no hope in any factor to prevent littering; it is better when it comes to the study by Al- Khatib *et al.* (2009) wherein men indicated that the "increase in moral and religious convictions" can be a factor to prevent littering. "Public awareness" stood out in the current study for female respondents, however the study by Al- Khatib *et al.* (2009) female indicated that "increase in moral and religious convictions" is the solution to littering.

d) Who do you think is responsible for street cleanliness?

For the question: "who do you think is responsible for street cleanliness?" the highest percentages of the respondents were from females who answered that both citizens and municipality (61%) are responsible for street cleanliness with males at 39% (Table2). More female respondents (48%) think the citizens are the one who are responsible for street cleanliness as compared to males (48%). More male respondents (52%) think the municipality is the one who are responsible for street cleanliness as compared to males respondents (48%).Most of the responses are balanced, so gender is not pronounced on whose responsible for street cleanliness. However females strongly feel that both citizens and municipality have a role to play. Therefore gender has influence on the perception of who is responsible for street cleanliness.

e)If public cleaning had to be conducted, would you participate?

In reference to Table 1 above, the question: "If public cleaning had to be conducted, would you participate?" the highest percentages were on "maybe" they can participate and of females at 83%. This actually means that people are not very committed to partake in public cleaning. The highest percentage of the respondents who said "never" is still females (58%) than males (42%). Here it

reflects that females are less environmental conscious that males. The females (83%) have indicated that maybe they can partake in public cleaning as compared to males (17%). The highest percentage under the answer "if I have nothing to do" is from males (60%) than females (40%). Because many females are willing to partake to street cleaning, but in one case the very same females indicated that they are not willing to partake in street cleaning. Therefore one can argue that gender has no influence on the participation of the respondents to street cleaning. This means that the results in Table 2 are not very conclusive on the above question.

4.1.2 Marital Status

Table 2 below shows the different responses based on marital status category (married, divorced and never married), looking at five different questions which are based on littering. These very questions are: Do you litter on streets, which litter constitutes most of your litter, which of the following can stop people from littering, who do you think is responsible for street cleanliness and if public cleaning had to be conducted would you participate? The different responses from marital status category are outlined on the table below:

Table 3: Marital Status on Littering

Question	Answer	Percentage of Respondents (%)		
		Married	Divorced	Never Married
Do you litter on streets?	Never	40	8	52
	When there is no bin	36	2	62
	Sometimes	49	20	32
	Mostly	96	0	1
Which litter constitute most of your littering?	Paper	42	12	46
	Bottles	42	10	58
	Cigarette butts	39	25	36
	Food packages	46	3	51
Which of the following can stop people from littering?	Moral & religious convictions	34	5	61
	Better street cleanliness	35	28	37
	Public awareness	48	0	52
	Availability of rubbish bins	79	0	21
	Nothing	46	30	31
	Fines/Penalties	36	13	51
Who do you think is responsible for street cleanliness?	Citizens	45	4	51
	Municipality	67	1	32
	Both citizens & the municipality	30	17	53
If public cleaning had to be conducted, would you participate?	Yes	34	11	55
	Never	54	4	42
	Maybe	63	4	33
	If I have nothing to do	86	10	4

a) Marital status and littering on streets

On the question: "do you litter on streets?" and the response that says "never", the never married respondents had the highest percentage (52%), followed by married (40%) and divorced (8%). From this assessment, the never married respondents are more environmental conscious than the other clusters. To the answer: "when there is no bin", the never married had the highest percentage (62%), followed by the married (36%) and the divorced (2%). The never married portrayed that the situation can lead them to litter, hence portrayed to be the highest only if there is no bin. The highest percentage to the answer "sometimes" was married people (49%), followed by never married (32%) and divorced (20%). To the answer: "mostly", the married (96%) had the highest percentage, followed by never married (1%) then divorced (0%). The married respondents litter on streets more than the other marriage clusters. Then the married respondents are less responsible than the other marriage clusters, meaning more focus should be focused to the married people. Therefore marital status has an influence on littering. From the study by Al-khatib *et al*., (2009) the married and widower had a high response of "never" replying to the similar question of littering on streets, of which is different from the current study. The single and divorce from the same question and study by Al-khatib *et al.*, (2009) indicated that "for absolute necessity" for them to litter, whilst on this current study, the unmarried indicated that they litter only when there is no bin. Perhaps there might be some factors that influence these responses.

b) Which litter constitute most of your litter?

The results of the above question are shown in Table 3 above. The results show that the never married (46%) had the highest percentage followed by married (42%) then divorced (12%). Then under bottles as a litter, the never married (58%) had the highest percentage followed by married (42%) and then divorced (10%). Then under food packages as a litter, the never married (51%) had the highest percentage followed by married (46%) and then divorced (3%).From bottles, paper and food packages, the never married respondents have the highest percentages, which means that never married respondents litter more by looking at these diversity of litter. Then under cigarette butts as a litter, the married (39%) had the highest percentage followed by never married (36%) and then divorced (25%). Therefore marital status has an influence on the type of litter disposed of on streets.

In Table 2 it was found that the males litter bottles more than the females. From the above, it suggests that it is the never married males that are littering more bottles.

c) Which of the following can stop people from littering?

To the question that says: "which of the following can stop people from littering?" had three options which were "moral and religious convictions, better street cleanliness, public awareness, availability of rubbish bins, nothing and fines/penalties". The highest percentage (79%) obtained from the respondents was the one of the "availability of bins" as a solution to littering and from the married. Then the response "moral and religious convictions" had a highest percentage (61%) from the never married respondent cluster followed by married (34%) and the divorced (5%). Then the response "better street cleanliness" had a highest percentage (37%) acquired by the never married respondent cluster followed by married (35%) and the divorced (28%). Then the response "public awareness" had a highest percentage (52%) obtained by the never married respondent cluster followed by married (48%) and the divorced (0%). Also the response "fines or penalties" had a high percentage (51%) acquired by the never married, followed by married (36%) then the divorced (13%). Therefore, the never married respondents believe that moral and religious conviction is the first option, then public awareness, fines/penalties and lastly better street cleanliness. These respondents believe that engaging the people is the best option to stop people from littering, through either the upgrading of their moral and religious convictions, public awareness, fines or better street cleanliness. However, the married respondents believed that availability of bins could be a solution to littering or nothing at all. Those that had the highest figure to the option: "availability of bins" were the married (79%), followed by then never married (21%) and then the divorced (0%). Those that had the highest figure to the option: "nothing" were the married (46%), followed by then never married (31%) and then the divorced (30%). Therefore married will opt for availability of rubbish bins, divorced believe that nothing can stop people from littering, then the never married believe moral & religious convictions can be the solution. Therefore marital status has an influence on littering. This study also reveals that there is no single solution to the problem of littering. Various options should be put in place appealing to different social groups giving a synergy. The study carried out by Al-khatib (2009) explicitly indicates that moral and religious convictions can be an everlasting solution to littering. Interestingly, from another study conducted by Al-khatib *et al*.

(2009) also came out with the same findings as the one above siting moral and religious convictions as a solution to street littering.

d) Who do you think is responsible for street cleanliness?

The above question had three options which were "citizens, municipality and both citizens and the municipality". The highest percentage from all the responses (67 %) was obtained from the option of the "municipality" as the one responsible for street cleanliness which was from the married respondents. Then the response "citizens" had a highest percentage from the never married respondent (51%) cluster followed by married (45%) and the divorced (4%). Then the response "municipality" had a highest percentage from the married respondent (67%) cluster followed by never married (32%) and the divorced (1%). Then the response "both citizens and municipality" had a highest percentage from the never married respondent (53%) cluster followed by married (30%) and the divorced (17%). The never married respondents therefore believe that the first option to the question: "who do you think is responsible for street cleanliness?" are both citizens and the municipality are responsible for street cleanliness.. Married on the other hand regarded the municipality as responsible. Therefore marital status has an influence on the perception of who is responsible for street cleanliness. This means that environmental education and related campaign shift the responsibility especially among married to citizens. Most of the respondents from the study by Al-khatib *et al*. (2009) indicated that both citizens and the municipality are responsible for street cleanliness.

e) If public cleaning had to be conducted, would you participate?

According to the above question, the highest percentage (86%) was from the response: "if I have nothing to do" and from the married. This actually means that married and very committed to partake in public cleaning. The highest percentage of the respondents who answered "yes" were from the never married (55%) cluster of respondents followed by the married (34%) and the divorced (11%). The never married represent young group and it seems like they are willing to participate. The highest percentage of the respondents who said "never" were married (54%) followed by the never married (42%) and the divorced. The married respondents (63%) have indicated that "maybe" followed by never married (33%) then divorced (4%). The highest percentage under the answer "if I

have nothing to do" is from married respondents (86%) followed by divorced (10%) then never married (4%). Therefore the marital status has influence on the respondents' participation to street cleaning. From the study by Al-khatib *et al*. (2009) majority of respondents indicated that they are willing to partake in in public cleaning, whilst the current study indicated that they will partake if they have nothing to do.

4.1.3 Monthly Income

Table 4 below shows the effect of monthly income on littering, the categories of monthly income is divided into three, the low (R0-7500), middle (R7500-15000) and high income earners high (>15000). The questions are: Do you litter on streets, which litter constitutes most of your litter, which of the following can stop people from littering, who do you think is responsible for street cleanliness and if public cleaning had to be conducted would you participate?

Table 4: Monthly Income on Littering

Question	Answer	Percentage of Respondents (%)		
		R0-7500	R7500-15000	R>15000
Do you litter on streets?	Never	11	41	48
	When there is no bin	41	38	21
	Sometimes	10	18	71
	Mostly	43	9	48
Which litter constitute most of your littering?	Paper	31	11	58
	Bottles	33	7	60
	Cigarette butts	11	53	36
	Food packages	24	38	38
Which of the following can stop people from littering?	Moral and religious convictions	12	19	61
	Better street cleanliness	14	42	35
	Public awareness	13	52	13
	Availability of rubbish bins	35	52	13
	Nothing	38	31	31
	Fines/Penalties	29	10	60
Who do you think is responsible for street cleanliness?	Citizens	50	14	13
	Municipality	14	37	27
	Both citizens & the municipality	13	48	60
If public cleaning had to be conducted, would you participate?	Yes	15	24	61
	Never	50	33	17
	Maybe	2	80	19
	If I have nothing to do	74	24	2

a) Monthly income

Table 4 above shows that with regards to the question that says: "do you litter on streets?" had three options which were "never, when there is no bin, sometimes and mostly". The highest percentage of responses was from the response: "sometimes" (71%), which are high earners (R15000), should be more educated. From the same question, the responses that says: "never" those who had the high percentages were the high earners (> R15000), followed by middle earners (R7500-15000) then the low earners (R0-7500). To the response: when there is no bin, the highest response was on low incomers (R0-7500), followed by middle earners (R7500-15000) then the low earners (R0-7500). To those responses that said: "sometimes" the highest response was on low incomers (R0-7500), followed by middle earners (R7500-15000) then the low earners (R0-7500). To the response that said: "mostly" the highest response was on high earners (R>15000), followed by low earners (R0-7500) and then middle earners (R7500-15000). Most high earners indicated that they do not litter at all as compared to other economic groups, which means that the wealthier you are the more environmental conscious you are likely to be. The middle earners also indicated that they litter a lot than other economic groups. Therefore the respondents' economic status has an influence on littering. However, in some cases results are not very conclusive. This can be attributed to different sample sizes within each category. However majority of respondents from the high earners from the study by Al-khatib *et al*. (2009) indicated that they litter "for an absolute necessity".

b) Which litter constitutes most of your littering?

In reference to Table 4 above, the highest percentage of responses by high earners (R15000) regarding what constitute most of your litter was bottles (60%). The highest percentage of those who litter paper was high earners (58%) followed by low earners (31%) and then middle earners (11%). Then with bottles, the highest percentage was that of high earners (60%) followed by low earners (33%) then middle earners (7%). The highest percentages of those respondents that litter cigarette butts were middle earners (53%) followed by high earners (36%) then low earners (11%). When it comes to food packages both middle and high earners contributed the highest percentages which is 38% followed by low earners (24%). The high income earners contribute most of bottles, paper and food packages. Then the middle earners contribute most litter in the form of cigarette butts and bit of

food packages. Therefore the respondents' economic status has an influence on the type of litter disposed of the streets. The response of "insufficient availability of litter cans" was the highest response from the study conducted by Al-khatib *et al*. (2009).

c) Which of the following can stop people from littering?

From question above three options were given which are: "moral and religious convictions, better street cleanliness, public awareness, availability of rubbish bins, nothing and fines/penalties". The highest percentage (61%) obtained from the respondents was the one of the "moral and religious convictions" as a solution to littering. Furthermore the response "moral and religious convictions" had a highest percentage (61%) from the high income earners followed by middle earners (19%) and the low earners (12%). Then the response "better street cleanliness" had a highest percentage (42%) acquired by the middle earners followed by high earners (35%) and the low earners (14%). Then the response "public awareness" had a highest percentage (52%) obtained by the middle earners followed by high and low earners (13%). Also the response "fines or penalties" had a high percentage (60%) acquired by the high earners, followed by low earners (29%) then the middle earners (10%). Those that had the highest figure to the option: "availability of bins" were the middle earners (52%), followed by low earners (35%) and then the high earners (13%). Those that had the highest figure to the option: "nothing" were the low earners (38%), followed by both middle and high income earners (31%). Therefore the high earners believe that moral and religious convictions and fine/penalties can be a solution to littering. Then the middle earners believe that availability of rubbish bins and public awareness can be a solution to littering. Then the low earners believe that availability of rubbish bins can be a solution to littering, if that then fails, then nothing can stop people from littering. Therefore the respondents' economic status has an influence on the perception of respondents with regard to what can stop people from littering. The study by Al-khatib *et al*. (2009) shows that majority of the respondents from the low earners think that "increased availability of litter cans" can stop respondents from littering.

d) Who do you think is responsible for street cleanliness?

The above question had three options which were "citizens, municipality and both citizens and the municipality". The highest percentage from all the responses (60%) was obtained from the option of the "both citizens and the municipality" as the ones responsible for street cleanliness. Then the response "citizens" had a highest percentage from the low income earners (50%) cluster followed by middle earners (14%) and the low earners (13%). Then the response "municipality" had a highest percentage from the middle earners (37%) cluster followed by high earners (27%) and the low earners (14%). Then the response "both citizens and municipality" had a highest percentage from the high earners (60%) cluster followed by middle earners (48%) and the low earners (13%). The high and middle earners took all the responsibility to both the municipality and citizens, and then the low earners regarded the citizens as responsible for street cleanliness. The response on low earners is surprising because those are the less educated and would expect to give the responsibility to the municipality. Therefore the respondents' economic status has an influence on the perception of respondents with regard to who is responsible for street cleanliness. However the study by Al-khatib *et al*. (2009) shows that the low earners and high earners believe that only the municipality is responsible for street cleanness.

e) If public cleaning had to be conducted, would you participate?

For the above question, the highest percentage (80%) was from the response: "maybe" and middle income earners. This actually means that people are not very committed to partake in public cleaning. The highest percentage of the respondents who answered "yes" were from the high earning (61%) cluster, followed by middle earners (24%) and the low earners (15%). The highest percentage of the respondents who said "never" were low earners (50%) followed by the middle earners (33%) and the high earners (17%). The highest percentage of the respondents who said "maybe" were middle earners (80%) followed by the high earners (19%) and the high earners (2%).The highest percentage under the answer " if I have nothing to do" is from were low earners (74%) followed by the high earners (24%) and the high earners (2%). From the above assessments, respondents who are willing to partake in street cleaning are the high earners followed by middle earners. The wealthier you are the more likely you are to partake in environmental campaigns. Those who said never are the low

income earners. The response of low income earners seem to contradict because in the above question, they indicated that citizens are the ones responsible for street cleanness. Therefore the respondents' economic status has an influence on the respondents' willingness to partake to street cleanliness.

4.1.4 Religious Convictions

The table below shows responses to the effect of religious conviction on littering (never committed, committed and highly committed). The questions are: Do you litter on streets, which litter constitutes most of your litter, which of the following can stop people from littering, who do you think is responsible for street cleanliness and if public cleaning had to be conducted would you participate? The questions asked were similar to the previous ones and are shown in the table below:

Table 5: Religious convictions and littering

Question	Answer	Percentage of Respondents (%)		
		Never Committed	Partially Committed	Highly Committed
Do you litter on streets?	Never	10	15	75
	When there is no bin	29	63	8
	Sometimes	79	9	14
	Mostly	35	35	35
Which litter constitute most of your littering?	Paper	52	38	10
	Bottles	49	44	7
	Cigarette butts	92	5	3
	Food packages	24	34	42
Which of the following can stop people from littering?	Moral and religious convictions	13	26	61
	Better street cleanliness	7	47	47
	Public awareness	70	9	20
	Availability of rubbish bins	4	74	22
	Nothing	85	15	0
	Fines/Penalties	72	20	8
Who do you think is responsible for street cleanliness?	Citizens	72	13	15
	Municipality	44	48	8
	Both citizens & the municipality	21	26	53
If public cleaning had to be conducted, would you participate?	Yes	25	36	39
	Never	67	21	13
	Maybe	81	13	6
	If I have nothing to do	80	6	14

a) Religious conviction and littering on streets

In accordance to Table 5, the question that says: "do you litter on streets?" had three options which were "never", "when there is no bin", "sometimes" and "mostly". The highest percentage of responses was from the response: "sometimes" (79%), which are never committed Christians. From the same question, the responses that says: "never" those who had the high percentages were those that are highly committed (75%), followed by the partially committed (15%) then the never committed (10%). To the response: "when there is no bin", the highest response was the committed (63%), followed by the never committed (29%) then the highly committed (8%). To the response that said: "mostly" all had the same percentage (35%) responses. The never committed Christians litter on street most of the times, the partially committed litter mostly when there is no bin and lastly the highly committed indicated that they never litter; most of them. This means that the highly committed responses are the ones that don't litter as compared to other respondents especially non-Christians. This means that the religious convictions has an effect of littering, the more religious a person is, the less likely to litter on streets. These results are interesting but not surprising because the bible has areas or verses where it talks about cleanliness, recycling and ever sustainable use of resources. Serious Christians however are the ones expected to be the most environmental friendly, unless if they do not practice what they preach. Only that some of the churches do not have the teachings on environmental education.

b) Which litter constitutes most of your littering?

To the question above, the overall highest percentage of response was from the never committed Christians, and the litter was cigarette butts (92%). The highest percentage of those who litter paper was the never committed Christians (52%) followed partially committed (38%) and then highly committed (10%). Then with bottles, the highest percentage was that of the never committed Christians (49%) followed by partially committed (44%) then highly committed (7%). When it comes to food packages the highest percentage was from the highly committed (42%), followed by the partially committed and then the never committed (24%). The type of waste littered clearly reflects the religious commitment of the respondents. The never committed Christians litter most of

bottles and cigarette butts, and the highly committed litters most of the food packages. Therefore religious conviction has strong influence on the type of litter disposed of. The study by Al-khatib *et al*. (2009) indicated that cigarette butts were the ones littered by those with low religious conviction, glass litter was highest to the respondents of the medium religious level and food was the highest to the highly committed respondents.

c) Which of the following can stop people from littering?

In reference to Table 4 the question that said: "which of the following can stop people from littering?" three options were given which are: "moral and religious convictions, better street cleanliness, public awareness, availability of rubbish bins, nothing and fines/penalties". The highest percentage (85%) obtained from the respondents, was the one of: "nothing" will stop people from littering. Furthermore the response "moral and religious convictions" had a highest percentage (61%) from the highly committed followed by committed (26%) and the never committed (13%). Then the response "better street cleanliness" had a highest percentage (47%) acquired by the both partially committed and highly committed respondents, followed by the never committed (7%). Then the response "public awareness" had a highest percentage (70%) obtained by the never committed followed by the highly committed (20%) and the partially committed (9%). Also the response "fines or penalties" had a high percentage (72%) acquired by the never committed, followed by partially committed (20%) then the highly committed (8%). Those that had the highest figure to the option: "availability of bins" were the committed (74%), followed by highly committed (22%) and then the never committed (4%). Those that had the highest figure to the option: "nothing" were the never committed (85%), followed by the partially committed (15%), and the highly. Therefore the highly committed believe that moral and religious convictions are the pillar to curb littering. Then the partially committed respondents were of the view that availability of bins could be the solution to littering. Finally the never committed were of the view that fines and penalties could be a solution. Then the integration of the three solutions, which are: availability of bins, fines and penalties and fines and penalties could yield positive outcome to the rescue of the environment. Therefore religious conviction has an influence on the perception of what can stop the respondents from littering.

d) Who do you think is responsible for street cleanliness?

According to the question that says: "who do you think is responsible for street cleanliness?" had three options which were "citizens, municipality and both citizens and the municipality". The highest percentage from all the responses (72%) was obtained from the option of the "citizens" as the one responsible for street cleanliness and from the non-committed Christians it sounds contradictory. Then the response "municipality" had a highest percentage from the partially committed (48%) cluster followed by never committed (44%) and the highly committed (8%). Then the response "both citizens and municipality" had a highest percentage from the highly committed (53%) cluster followed committed (26%) and the never committed (21%). The never committed respondents were of the view that the people who are responsible for street cleanliness are the citizens, yet from the earlier responses are not willing to participate. The partially committed believe that the municipality are responsible for street cleanliness, whilst the highly committed thought both the citizens and the municipality are responsible for street cleanliness. Therefore religious conviction has strong influence on the perception of respondents with regard to those responsible for street cleanliness. Al-khatib *et al*. (2009) study under the medium and high level of religion that both citizens and municipality are the ones responsible for street cleanness, whilst the low level of religion believed that the local municipality only is responsible.

e) If public cleaning had to be conducted, would you participate?

To the question: "If public cleaning had to be conducted, would you participate?" the highest percentages were81% from the response: "maybe" and 80% "if there is nothing to do". Both these responses are coming from the never committed Christians. This actually means that people are not very committed to partake in public cleaning. The highest percentage of the respondents who answered "yes" were from the highly committed (39%) cluster, followed by committed (36%) and the never committed (25%). Therefore religious conviction has an influence on the type of litter disposed of. The results from the study by Al-khatib *et al*. (2009) indicate that the more the level of religious conviction increases the more the willingness to partake in public street cleaning campaign.

4.1.5 Age

Table 6 below shows the responses with regard to the effects of age on littering. The questions that are part of the survey are similar as before and they are presented below in a table format:

Table 6: Age and littering

Question	Answer	Percentage of Respondents (%)		
		0-17 years	18-35 years	>36 years
Do you litter on streets?	Never	1	26	72
	When there is no bin	1	83	17
	Sometimes	0	60	40
	Mostly	0	30	70
Which litter constitute most of your littering?	Paper	0	59	41
	Bottles	0	50	50
	Cigarette butts	0	78	22
	Food packages	0	66	34
Which of the following can stop people from littering?	Moral and religious convictions	0	30	70
	Better street cleanliness	0	93	7
	Public awareness	0	72	28
	Availability of rubbish bins	0	64	36
	Nothing	0	92	8
	Fines/Penalties	2	51	47
Who do you think is responsible for street cleanliness?	Citizens	0	71	29
	Municipality	1	47	52
	Both citizens & the municipality	1	53	46
If public cleaning had to be conducted, would you participate?	Yes	1	62	37
	Never	0	46	4
	Maybe	0	54	46
	If I have nothing to do	0	22	78

a) Age and littering on streets

It should be noted that age of 1 to 17 years are considered as children, 18-35 years are youth/ young people and above 35 years are adults. The highest percentage of responses was from the response: "when there is no bin" (83%), which were the young people. From the same question, the responses that answered: "never" with the highest percentages were elderly respondents (72%), followed by young respondents (26%) then the children (1%). To those responses that replied: "sometimes" the highest response was the young respondents (60%), followed by the elderly respondents (40%) then the children (0%). To the response that said: "never" with the highest percentages were elderly

respondents (70%), followed by young respondents (30%) then the children (0%). This means that the elderly indicated that they do no litter on streets as compared to other age groups. The young respondents only litter if the bins are not available, this means that there is no commitment by the young people. Children do not litter a lot as well. Age has strong influence on street littering and this suggest young adults should be targeted. Al- Khatib *et al.* (2007) found that most of the respondents who answered "never" were from the following age groups: 15-20, 31-50 and over the age of 50 years, whilst the age group 21-30 the response was "for absolute necessity".

b) Which litter constitutes most of your littering?

The overall highest percentage of response from the question above was from the young respondents, and the litter was cigarette butts (78%), It therefore suggests that most young people in the city smoke. The highest percentage of those who litter paper was the young respondents (59%) followed by the elderly respondents (41%) and then children respondents (0%). Then with bottles, the highest percentage was that of the young and elderly respondents (50%). This may suggest that young and elderly people equally drink. When it comes to food packages the highest percentage was from young respondents (66%), followed by elderly respondents (34%) and then the young respondents (0%). This suggests that young people are wasteful and it might be because of little responsibilities. The type of waste littered clearly reflects the religious commitment of the respondents.. The study by Al- Khatib *et al.* (2007) explicitly indicated that the highest percentage of litter thrown by the age group 12-14 and 14-20 years was glass bottles. The most common litter for the age group 21-30 years were glass bottles and cigarette butts. For the age 31 and above was food waste.

c) Which of the following can stop people from littering?

From the question above, the highest percentage (93%) obtained from the respondents, was the one of: "better street cleanliness" will stop people from littering and this was from young people. Furthermore the response "moral and religious convictions" had a highest percentage (70%) from the elderly respondents followed by young people (30%) and the children (0%). This means that elderly people are the most committed Christians. Then the response "public awareness" had a highest percentage (72%) obtained by the young respondents followed by the elderly (28%) and the children (0%). Also the response "fines or penalties" had a high percentage (51%) acquired by the young

respondents, followed by elderly (47%) then the children (2%). Those that had the highest figure to the option: "availability of bins" was the young respondents (64%), followed by elderly (36%) and then the children (0%). Those that had the highest figure to the option: "nothing" was the young (92%), followed by the elderly respondents (15%), and then the children (0%). Therefore the elderly respondents believe that moral and religious convictions can stop people from littering, whilst the young respondents believe that better street cleanliness is the best option. Age has influence on the perception of respondents as to what can stop people from littering. The study undertaken by Al-Khatib (2009) shows that the solution to prevent children from throwing litter on the streets is through moral and religious convictions.

d) Who do you think is responsible for street cleanliness?

From the above question, the highest percentage from all the responses (71%) was obtained from the option of the "citizens" as the one responsible for street cleanliness and young people. Then the response "municipality" had a highest percentage from the elderly (52%) cluster followed by young respondents (47%) and the children (1%). Then the response "both citizens and municipality" had a highest percentage from the young respondents (53%) cluster followed by the elderly (46%) and the children (1%). Therefore most of the elderly respondents believe that the municipality is the one responsible for street cleaning, whilst the young respondents believe that both citizens and the municipality are responsible for street cleanliness. Age has influence on the perception of respondents on who is responsible for street cleanliness. The study conducted by Al- Khatib *et al.* (2007) shows that the general agreement for all age groups was that street littering is a responsibility of both the citizens and the municipality.

e) If public cleaning had to be conducted, would you participate?

The highest percentage with regards to the above question (78%) was from the response: "if I have nothing to do". This actually means that adults are not very committed to partake in public cleaning. The highest percentage of the respondents who answered "yes" were from the young respondents (62%), followed by the elderly respondents (37%) and the children (1%). The highest percentage of the respondents who said "never" were young respondents (46%) followed by the elderly respondents (4%) and the children (0%). The highest percentage of the respondents who said

"maybe" were young respondents (54%) followed by the elderly respondents (46%) and the children (0%).The highest percentage under the answer " if I have nothing to do" was from the elderly respondents (78%) followed by the young respondents (22%) and the children (0%). From the above assessments, respondents who are willing to partake in street cleaning are the young respondents, however most of the elderly never litter. Therefore age has a strong influence on the willingness to partake in street cleaning.

4.1.6 Educational Background

Table 7 below explicitly demonstrate the effect on educational background on littering. The surveyed was conducted to: those that never attended, grade R-7, 8-12 and the tertiary level. The questions asked were similar to earlier ones and are shown in table 7 below:

Table 7: Educational Background on Littering

Question	Answer	Percentage of Respondents (%)			
		Never Attended	Grade R-7	Grade 8-12	Tertiary Level
Do you litter on streets?	Never	40	1	1	57
	When there is no bin	53	0	0	47
	Sometimes	49	0	0	51
	Mostly	52	0	0	48
Which litter constitute most of your littering?	Paper	10	0	0	90
	Bottles	69	0	0	31
	Cigarette butts	75	0	0	25
	Food packages	52	1	1	46
Which of the following can stop people from littering?	Moral and religious convictions	67	1	2	31
	Better street cleanliness	21	0	0	79
	Public awareness	54	0	0	46
	Availability of rubbish bins	90	0	0	10
	Nothing	62	0	0	38
	Fines/Penalties	18	0	0	82
Who do you think is responsible for street cleanliness?	Citizens	62	1	0	37
	Municipality	60	0	0	40
	Both citizens & the municipality	33	0	1	66
If public cleaning had to be conducted, would you participate?	Yes	37	0	1	62
	Never	75	0	0	25
	Maybe	52	0	0	48
	If I have nothing to do	100	0	0	0

a) Educational background and littering on streets

The results of the relationship between littering on the street and education are shown from Table 7.The highest percentage of responses was from the response: "when there is no bin" (53%), which were those who never attended school. From the same question, the responses that answered: "never" with the highest percentages were those respondents who have a tertiary level (57%), followed by those who never attended school (40%) then the primary and secondary school level (1%). To those responses that replied: "sometimes" the highest response was the tertiary level respondents (51%), followed by the those that never attended school (49%) then the primary and secondary school respondents (0%). To those responses that replied: "mostly" the highest response was the tertiary level respondents (52%), followed by the those that never attended school (48%) then the primary and secondary school respondents (0%). The percentages differences between those with tertiary education and those who never went to school are very close on many questions regarding littering on street. This suggests that education has no strong influence on street littering. Even those who never went to school could be aware of environmental issues related to littering. The study by Al-Khatib *et al.* (2007) agrees with results of the current study in that education seemed not to have influence on littering. Those that are illiterate, elementary and secondary education indicated that they never litter on streets, whilst those that completed tertiary institution indicated that they litter " for absolute necessity". .

b) Which litter constitutes most of your littering?

The results of the responses to the above question are interesting (Table 7). The overall highest percentage of response was from those that attended school and tertiary with paper 90% as most litter.. Then with littering bottles, the highest percentage was that of the never attended school at 69%. The highest percentages of those respondents that litter cigarette butts were those who never attended school (75%) followed by tertiary school level respondents (25%). When it comes to food packages the highest percentage was from never attended school respondents (52%), followed closely by tertiary level respondents (46%). The highly educated litter paper most which is expected because they read newspapers and can afford fast foods which is packaged in plastic or paper. The non-educated litter bottles and cigarettes as compared to the educated. This is also a social concern because they are the least paid and generate food waste as the educated. The study by Al- Khatib *et al.* (2007) indicated that the illiterate litter a lot of food waste, and with literate had high bottle litter.

This had similar findings. However, educational background has an influence on the type of litter disposed of.

c) Which of the following can stop people from littering?

Table 7 below explicitly shows the results on the influence of education on methods that can stop people from littering, and this was from the tertiary educated respondents. The highest percentage (79%) obtained from the respondents, was the one of: "better street cleanliness" will stop people from littering. Furthermore the response "moral and religious convictions" had a highest percentage (67%) from the respondents who never attended school followed by tertiary level (31%) and the secondary (2%) and primary school (1%). Then the response "public awareness" had a highest percentage (54%) obtained by the never attended respondents followed by the tertiary level (48%) and the primary and tertiary level (0%). Also the response "fines or penalties" had a high percentage (82%) acquired by those who went to tertiary level, followed by those who went never went to school (18%) then the primary and secondary school (0%). Those that had the highest figure to the option: "availability of bins" was those that never attended school (90%), followed by those that reached tertiary level (10%) and then the primary and secondary school (0%). Those that had the highest figure to the option: "nothing" was those that never attended school (62%), followed by those in tertiary level (38%), and then the primary and secondary school (0%). These results are also interesting. The non-educated believe that moral and religious conviction and availability of bins can stop littering. They do not believe in fines and penalties. However, earlier these were found to be most people who throw cigarette butts and bottles litter. Therefore, educational background has an influence on what can stop people from littering.

d) Who do you think is responsible for street cleanliness?

The results of the question above are articulated and discussed in details below. The highest percentage from all the responses (66 %) was obtained from the option of the "both citizens and the municipality" as the one responsible for street cleanliness from the respondents who had tertiary education. The response "citizens" had a highest percentage from the never attended school (62%)

followed by those who went to tertiary level (37%) and the primary level (1%) then high school (0%). Then the response "municipality" had a highest percentage from those who never attended school (60%) cluster followed by those who reached tertiary level (40%) and the primary and secondary level (0%). Then the response "both citizens and municipality" had a highest percentage from the tertiary level respondents (66%) cluster followed never attended (33%) and the secondary school respondent (1%) and primary respondents (0%). The results show the balance between the non-educated and tertiary educated on who is responsible for street cleanliness. This is because the non-educated had 66% for citizens and 60% for the municipality as responsible for street cleanliness. The tertiary educated gave charge of street cleanliness to both citizens and the municipality at 66%. This means that education has got a weak influence on who is responsible for keeping Pretoria clean. From the study conducted by Al- Khatib *et al.* (2007) the general consensus among the interviewee was that both citizens and the municipality are responsible for street cleanliness. In essence it is good to have a joint effort from the citizens and municipality to ensure better cleanliness.

e) If public cleaning had to be conducted, would you participate?

For the question: "If public cleaning had to be conducted, would you participate?" the highest percentage (100%) was from the response: "if there is nothing to do". This actually means that non-educated people are not very committed to partake in public cleaning. The highest percentage of the respondents who answered "yes" were from the tertiary level respondents (62%) cluster, followed by never attended school (37%), educated people therefore are willing to participate. The highest percentage of the respondents who said "never" were those that never attended school (75%) followed by the tertiary level respondents (25%) and the primary and secondary level respondents (0%). This is not surprising since they are the ones who said only if they had nothing to do. Those who never attended school will only partake in public cleaning campaigns when they have nothing to do, and then both high and tertiary school respondents were willing to partake. Then educational background has a strong influence on willingness of the respondents to partake in street cleaning. From the study by Al- Khatib *et al.* (2007) there was a general agreement to willingly partake in public cleaning. It would be much appreciated that people regardless of their educational background partake in cleaning campaigns. It is assumed that when people clean the environment they cannot at the same time litter, because they know that they are the ones who are going to clean the area again.

4.17 Place of Residence

The table below shows responses to the effect of place of residence on littering (Pretoria Central Business District, Garsfontein and Marabastad). The questions asked were similar to the previous ones and are shown in the table below:

Table 8: Place of Residence and Littering

Question	Answer	Percentage of Respondents (%)		
		Garsfontein	Marabastad	Pretoria CBD
Do you litter on streets?	Never	36	23	31
	When there is no bin	19	32	46
	Sometimes	40	37	21
	Mostly	5	8	2
Which litter constitute most of your littering?	Paper	36	2	46
	Bottles	27	20	37
	Cigarette butts	27	2	2
	Food packages	9	74	15
Which of the following can stop people from littering?	Moral and religious convictions	32	26	12
	Better street cleanliness	14	6	10
	Public awareness	1	12	24
	Availability of rubbish bins	4	9	38
	Nothing	0	8	0
	Fines/Penalties	49	38	16
Who do you think is responsible for street cleanliness?	Citizens	21	27	26
	Municipality	15	39	30
	Both citizens & the municipality	64	34	44
If public cleaning had to be conducted, would you participate?	Yes	89	37	88
	Never	1	13	2
	Maybe	7	23	6
	If I have nothing to do	3	27	4

a) Place of residence and littering on streets

To the first question on: "do you litter on streets?" and the response that says "never", the Garsfontein respondents had the highest percentage (36%), followed by Pretoria Central Business District (CBD) (31%) and Marabastad (23%). From this assessment, the Garsfontein respondents are more environmental conscious than the other clusters. This is the most affluent group consisting primarily of middle class. To the answer: "when there is no bin", the Pretoria CBD respondents had the highest percentage (46%), followed by those from Marabastad (32%) and then Garsfontein (19%). The highest percentage to the answer "sometimes" was Garsfontein (40%), followed by Marabastad (37%) and Pretoria CBD (21%). To the answer: "mostly", the respondents from

Marabastad (8%) had the highest percentage, followed by Garsfontein (5%) then Pretoria CBD (2%). From the results, there is no strong relationship between littering on the street and place of residence. This is because the results are not explicit. However, the respondents from Garsfontein litter less as compared to other residences..

b) Which litter constitutes most of your littering?

In the answer to the question stated above, the overall highest percentage of response was from those that are from Marabastad, and the litter was food packages (74%). This is surprising because these are the respondents from the area which is considered to be a lower class. The highest percentage of those who litter paper were those who are from Pretoria CBD (46%) followed by the Garsfontein respondents (36%) and then Marabastad (2%). This expected because the respondents are perceived to be the middle class. Then with bottles, the highest percentage was that of the Pretoria CBD (37%) then those from Garsfontein and Marabastad. The highest percentages of those respondents that litter cigarette butts were those from Garsfontein (27%) followed by those from Marabastad and Pretoria CBD (2%). The Garsfontein respondents litter much of paper, then those from Mrabastad litter much of food packages and then Pretoria CBD is paper. The place of residence has influence on the type of littering disposed of, though results are not conclusive. This is because on influence of education on the type of littering, the never educated. The never educated littered mostly bottles and cigarette butts. Therefore residents from Marabastad were expected to litter a lot as they represent less educated place of residence.

c) Which of the following can stop people from littering?

In response to the above question, he highest percentage (49%) obtained from the Garsfontein respondents was penalties. Furthermore the response “moral and religious convictions” had a highest percentage (32%) again from the respondents from Garsfontein, followed by Marabastad (26%) and Pretoria CBD (12%). Then the response “better street cleanliness” had the lowest response from each residential areas. Then the response “public awareness” had a highest percentage (24%) obtained by the Pretoria CBD. Fines and penalties got high response from Marabastad (38%) then those from Pretoria CBD (16%). Those that had the highest figure to the option: “availability of bins” were those from Pretoria CBD (38%). The highest percentage under Garsfontein and Marabastad respondents is

fines/penalties can stop people from littering. Then Pretoria Central Business District (CBD) respondents believe that availability of bins can be a solution to street littering. Therefore, place of residence has an influence on the perception of people on what can stop people from littering.

d) Who do you think is responsible for street cleanliness?

The results of the above question show that the highest percentage from Garsfontein respondents (64%) was obtained from the option of the "both citizens and the municipality" as the ones responsible for street cleanliness. Then the response "municipality" had a highest percentage from Marabastad respondents (39%) followed by those from Pretoria CBD (30%) and the Garsfontein respondents (15%). The respondents from Marabastad believed that the municipality is the one responsible for street cleaning, whilst both Garsfontein and Pretoria CBD believe that both citizens and the municipality are responsible for street cleanliness. Therefore, place of residence has an influence on the perception of who is responsible for street cleanliness.

e) If public cleaning had to be conducted, would you participate?

In response to the above question the highest percentage (89%) was from the response: "yes" and the answer was from Garsfontein respondents. This actually means that respondents are very committed to partake in public cleaning. The highest percentage of the respondents who answered "yes" were from Garsfontein (89%), followed by Pretoria CBD (88%), and then Marabastad (37%). This shows that people in Pretoria Central Business District are also willing to participate. The highest percentage of the respondents who said "never" were those Marabastad (13%) followed by Pretoria CBD respondents (2%) and then Garsfontein (1%). The highest percentage of the respondents who said "maybe" were those from Marabastad (23%) followed by those from Garsfontein (7%), then Pretoria CBD (6%).The highest percentage under the answer " if I have nothing to do" is from Marabastad (27%) followed by those from Pretoria CBD (4%), then Garsfontein (3%). All the respondents regardless of their place of residence are willing to partake in street cleanliness. But those middle class seem to be more willing. Therefore place of residence has no influence to the participation to public cleaning.

4.2 Relationship between variables that affect littering

Table 8 below explicitly demonstrate the significant relationship between different variables. It looks at the gender, marital status, monthly income, religious conviction, educational background and age in relation to street littering, litter composition and solutions to littering.

Table 9: Littering variables, probability (p) and significance

Variables	Probability (P)	Significance
a) Gender		
Gender versus street littering	P>0.05	Less significant
Gender versus litter composition	P<0.01	Highly significant
Gender versus solution to littering	P<0.01	Highly significant
b) Marital status		
Marital status versus street littering	P>0.05	Less significant
Marital status versus litter composition	P<0.05	Highly significant
Marital status versus solution to littering	P<0.01	Highly significant
c) Monthly income		
Monthly income versus street littering	P<0.01	Highly significant
Monthly income versus litter composition	P<0.01	Highly significant
Monthly income versus solution to littering	P<0.01	Highly significant
d) Religious convictions		
Religious conviction versus street littering	P<0.01	Highly significant
Religious conviction versus litter composition	P<0.01	Highly significant
Religious conviction versus solution to littering	P<0.01	Highly significant
e) Educational background		
Educational background versus street littering	P>0.01	less significant
Educational background versus litter composition	P<0.01	Highly significant
Educational background versus solution to littering	P<0.01	Highly significant
f) Age		
Age versus street littering	P<0.01	Highly significant
Age versus litter composition	P<0.01	Highly significant
Age versus solution to littering	P<0.01	Highly significant

a) Gender

Table 8 above illustrates that the relationship between gender and street littering is not significant ($p>0.05$). This insignificance is also evident because of a slight difference between the respondents who never litter on streets among females and males. This actually shows that gender has a minimal effect on littering. However, gender has been seen as having influence on litter composition. Females litter most of the food packages and bottles ($p<0.01$). Al-khatib *et al.* (2009) study indicated that cigarette butts were the most items littered by males. There is a significant relationship between gender and solutions to littering ($p<0.01$). There were some males who believed that nothing can be done to solve with the issue of littering, and no similar response was given by females. (Please refer to appendix (a) to (c)).

b) Marital Status

Marital status has an influence on street littering, as explicitly explained in table 8 above ($p<0.01$). In this very same study it was found that both the married and divorced had the highest responses of those who indicated that they "sometimes" litter on street, whilst the never married indicated that they never litter ($p<0.01$). Marital status has a significance influence on litter composition ($p<0.05$). Both the married and never married indicated that food packages are the most common litter and paper for the divorced. Marital status again has been uncovered to have significant influence on littering ($p<0.01$). Both the divorced and never married indicated that penalties/fines as the most preferred way to stop littering and availability of bins for married people. (Please refer to appendix (a) to (c)). Al-khatib *et al.* (2009) showed the correlation between marital status and littering habits ($p<0.05$). This study Al-khatib *et al.* (2009) agrees firmly with the current study on the littering habit.

c) Monthly income

Looking at the findings in table 8 above, monthly income has a significant influence on street littering ($p<0.01$). Respondents earning between R0-7500 indicated that they litter only when there is no bin, R7500-15000 respondent "never" and >R15000 indicated that they litter "sometimes". This shows that middle incomers are the ones that are more responsible. The study by Al-khatib *et al.* (2009) indicates that the lower earners are the ones that are more responsible, and this might be

attributed to the lessons that are taught at school as part of their curriculum ($p<0.05$). Monthly income has a significant relationship on litter composition ($p<0.01$), as indicated on table 8 above. The highest percentage from the income group between R0-7500 to the litter composition was paper, food packages for income group between R7500-15000 and bottles for the income above R15000. With reference to table 8 above, monthly income has a significant influence on solutions to stop littering ($p<0.01$). Penalties have been regarded as a most preferred solution to the income earners from R0-7500 and >R15000. The availability of bins and public awareness were regarded as the most preferred solution to littering by those earning above R15000. (Please refer to appendix (d) to (e). The study by Al-khatib *et al.* (2009) elaborated that "increase moral and religious conviction" as the best option to abate street littering from the family income of 1001-2000 and more than 4000 NIS.

d) Religious convictions

The findings summarised from table 8 above shows the significant relationship between religious convictions and littering on streets ($p<0.01$). The highly committed respondents indicated that they "never" litter on streets, hence the partially committed chose "only when there is no bin" and "sometimes" for never committed. This means that the committed are more responsible than any other groups. Al-khatib *et al.* (2009) indicated that the insufficient litter cans is a leading root cause of littering ($p<0.05$). Also there is a significant influence of religious convictions on littering composition ($p<0.01$). Most litter composition for never committed respondents were paper, bottles for partially committed and food packages for highly committed. Religious convictions has influence on solution to stop littering ($p<0.01$). (Please refer to appendix (f) to (h). Highly committed respondents indicated that the most preferred option to stop littering was "moral and religious convictions", penalties for never married and availability of bins for partially committed.

e) Educational background

Table 8 above clearly indicates there is no significant relationship between educational background and street littering, the difference happens by chance ($p>0.01$). The highest number of respondent from different educational background indicated that they "never" (grade R-7, grade 8-12 and tertiary level) and those who never attended indicated that they litter when there is no bin. Al-khatib *et al.*

(2007) indicated that the highest percentage of the respondents who replied never were from the illiterate ($p<0.05$). Litter composition has significant relationship on litter composition ($p<0.01$).The composition of litter was food packages for those who never attended, grade R-7, grade 8-12 and paper for those who have tertiary level. There is a significant relationship between educational background and solutions to littering ($p<0.01$). (Please refer to appendix (i) to (k)). Moral and religious conviction has been mostly approved by never attended, grade R-7, grade 8-12. It is those who have a tertiary educational background who indicated that penalties are a solution to littering.

f) Age

Table 8 above indicate that age has a significant relationship on street littering ($p<0.01$). Most of the respondents from age group 0-17 and above 35 indicated that they "never" litter on streets, whilst the age group 18-35 indicated that they litter "sometimes". The study by Al-khatib *et al.* (2007) indicates that most of the age groups indicated that "never" was the most common response to street littering. These two studies complement each other. Age again has a relationship on litter composition ($p<0.01$). The age group between 18 and 35 indicated that food packages are mostly litter and bottles for those above 35. The age group between 0 and 17 years do not litter. Al-khatib *et al.* (2007) indicated that bottles were the most littered between 12 to 20 years. There is a significant relationship between age and solution to littering ($p<0.01$). (Please refer to appendix (l) to (n)). The age group between age group 0 to 17 and 18 to 35 indicated that penalties are a solution to littering, whilst those above 35 opted for moral and religious convictions.

g) Place of residence

Table 9 below shows the significant relationship between different variables, namely place of residence versus the residents' views to litter on streets and participation of respondents to public cleaning.

Table 10: Littering variables, r-value and significance

Variables	r-value	significance
g) Place of residence		
Place of residence versus respondents to litter on streets	r=0.06103	Highly significant
Place of residence versus participation to street cleaning	r=0.51214	Highly significant

Table 9 above shows the significant correlation between place of residence and the view of the respondents when they see litter on streets (r=0.061). This means that the better and more advanced the residential area is, the more likely for the residents to have problem when they see litter on streets. This might be attributed to high level of education in advanced settlements.

There is a significant correlation between place of residence and the participation of people to street cleaning (r=0.5121). Most of the respondents from Garsfontein and Pretoria Central Business District (CBD) demonstrated their willingness to partake in street cleaning campaign as compared to Marabastad. More advanced residence has the will to partake in street cleaning than less advanced residences. The study by Al-khatib *et al*. (2007) agreed to the very same results by showing the suburbs and city centre as the residents who high number of respondents that said they never litter on streets.

4.3 Results of the Visual Inspection

4.3.1 Availability of bins

The visual inspections in Garsfontein and Pretoria Central Business District (CBD) uncovered similar findings, with the exception of Marabastad. In every 150 radius and less of Garsfontein and Pretoria Central Business District one would be able to find a bin. This was mostly evident in the shopping centres and the parks. This perhaps is the reason why these areas were very tidy. However when it comes to Marabastsd, bins were visible in some areas and in other areas they were not. Maybe this is one of the reasons which cause Marabastad to be untidy. Surprisingly, early in the morning Marabastad looked much cleaner as compared to the late hours. The street vendors wake up

in the morning and clean the streets where they sell their goods. It is the reason why Marabastad looks much cleaner in the morning. The study that was conducted by Al-Khatib (2009) unavailability of bins was cited as the common cause of street littering. Another study by Al- Khatib *et al.* (2007) agreed that the increase in garbage cans could serve as a solution to street littering

The condition of the bins is another factor that contributes to untidy environment. Most of the bins in Garsfontein are in exceptional condition, however in some cases it was observed that the bins were without the bottom part, this made the waste to drop down to the ground when one put litter in the bin. When it comes to Pretoria Central Business District (CBD), many bins were found to be in bad condition, especially when moving away from the busy street of the town. Same as the situation at Garsfontein, some of the bins didn't have the bottom part. Apart from little bins on streets Marabastad had many faulty bins which had no bottom part. Maybe this is one of the reasons why there is too much of litter in this area.

One other factor which is very much important in waste management in cities and busy shopping centres is to ensure that there is frequent and consistent collection of waste. It was observed that in Garsfontein, waste was collected every Tuesday, Thursday in Marabastad and Wednesday in Pretoria Central Business Business. In Marabastad it was therefore observed that one day before bins were collected, the bins were overflowing with trash and the flies hovering around the bins. Most of the litter dropped in the bins were bulky and it made the bins to reach the brim quickly. It is not only in Marabastad where there is a bulky waste disposed of the bins but also in some parts of Pretoria Central Business District (CBD), where there are street vendors. The attitude of the people in Garsfontein is positive; it is very rare to find a person throwing litter on the street as compared to Marabastad and Pretoria Central Business District (CBD).

When it comes to labelling of the bins, in all the sampled areas bins in public areas are not labelled. It is only at Garsfontein homes wherein they put garden waste in green bins which are labelled as such. It is surprising that where there are boards indicating that people must take care of the environment and keep it clean, it is where littering is predominant. In Garsfontein, none of the boards restricting people from littering was observed, but it was the one which was seen as the most tidy. However, in Pretoria Central Business District (CBD), many boards were placed visibly to encourage people to

keep the environment clean, but it continued to be untidy. However, some of the areas in Pretoria Central Business District (CBD) are becoming tidier and this is a positive step in a right direction. One can safely conclude that Garsfontein is cleaner than Marabastad and Pretoria Central Business District (CBD).

4.4 Possible solutions to littering problem in the study area

4.4.1 Moral and religious convictions

Moral and religious convictions have been seen as a strong solution to littering based on the results of this study. Those who indicated that they do not litter on the street are the ones that have got high moral and religious conviction. These results can be clearly interpreted that moral and religious conviction is a corner stone to littering. If churches can be canvassed to bring more of the residents to churches and teach about moral regeneration, this can be a step in a right direction. The study conducted by Al- Khatib *et al*. (2009) indicates that the vast majority of the interviewee had a common ground that the factors that might lead to the decline in littering is moral and religious convictions. It is true because in some of the churches they have seminars in waste management. These seminars teach the Christians on staying in a healthy environment, so if many people can be brought to churches, then this will definitely change the state of issues in our environment.

4.4.2 Availability of bins

From the observed results attained through visual inspection, it was found that where there are more bins littering is minimal. People in many cases are lazy to walk for a long distance looking for a bin to dispose of the waste. So many bins can lead to decline in littering. The results of this study indicate that the highest percentage obtained from the respondents was the one of the "availability of bins" as a solution to littering and from the married. The study executed by Al- Khatib *et al.* (2007) agreed that the increase in garbage cans could serve as a solution to street littering. This actually means that if we can increase more of bins, then there is a prospect for the decline in littering. Some people are vocal when they see another person throw litter on the ground when there is a litter can nearby.

4.2.3 Public awareness campaign

From the results of this study most females indicated public awareness is a solution to littering behaviour. The study by Al- Khatib *et al.* (2007) the anti-litter awareness campaign will be a solution in reducing litter in public places. Sekito *et al.* (2013) revealed that the implementation of community-based waste management has positive effects on waste discharge behavior. From the very same study by Al- Khatib *et al.* (2007) it was further revealed that there were no residents disposing their waste on the side of the road, into river streams or burning their waste illegally where community-based waste management was already implemented. Through these entire results, one can attest and conclude that there is a need for campaigns on littering to kick start and this has high chances of yielding positive outcome.

4.2.4 Fines and Penalties

The initiation of fines and penalties can stand as one of the best solution to deal with littering behaviour. The Garsfontein respondents came out and support the fines and penalties to deal with the issue of littering. This can be done through the municipal by-laws, ensuring that there is minimal discharge of waste in public places. Based on the study by Al-Khatib *at al.* (2009) fines was a less preferred solution to littering as compared to other options.

4.2.5 Integrated approach

There is a slight difference between the findings acquired by the questionnaire and visual inspection tools. This means that there is a need to integrate all the progressive techniques to yield positive outcome. Maybe the integration of moral regeneration, public campaign, maintaining the bins and availability of bins can be a sustainable solution.

Chapter 5: Conclusion and Recommendations

5.1 Conclusion

This project investigated the influence of biographic factors and religious convictions on littering to enhance waste management in Pretoria City, South Africa. The most important benefit of this study was to establish the effects of age, marital status, gender, place of residence, educational background, income and religious convictions on littering. The widespread results indicated that the most litter that is disposed of the streets is food packages and bottles. Most of the respondents indicated that the responsibility of street cleanliness lies on the joint venture between the citizens and municipality. It was also established within this project that enhancing moral and religious conviction was the most preferred solution to street littering. Males litter more of bottles, and food packages for females. This has been observed time and again because men drink a lot and women are usually in the kitchen. The respondents with the monthly income that ranges between R0-7500 indicated that citizens are the ones responsible for street cleanliness. Those within the income greater than R7500 indicated that both citizens and the municipality are responsible for street cleanliness. Religious convictions, like other variables have demonstrated its influence on the type of litter disposed of the streets by the respondents. The high committed respondents litter more of food packages, and cigarette for the never committed. It was interestingly uncovered on this very study that paper was the most predominant litter to those that went to tertiary level as compared to cigarette butts for those who never attended school. When it comes to the participation on street cleaning, those of the age group from 0-17 and 18-35 years old indicated that they will partake in street cleaning. Then the respondents of the age above 35 indicated that they will partake in street cleaning "if there is nothing to do". From all residential areas, most of the respondents indicated that they are willing to partake in street cleaning.

It was established from this very study that the biographic and religious convictions have a significant effect on littering. The underlying secret established from this study is that religious convictions, awareness, penalties, routine collection of bins and availability of bins are the

overriding solutions to littering. These results were obtained through site inspection and the use of questionnaire.

5.2 Recommendations

First and foremost it is recommended that the Tshwane Metropolitan Municipality develop an awareness strategy that is going to focus on educating the public about the effects of waste on the environment. Their target audience can be churches, schools and the public in general. The issue of littering has been seen as being propelled by the mindset of the people. It is therefore assumed that if the mindset can be altered, then there is a prospect of positively dealing with the littering problem. Enhancing the moral and religious convictions of people can be a solution to littering; it is one of the recommendations. Churches and schools must put more emphasis on staying in a clean and healthy environment. This study indicated that the males litter more bottles; therefore the owners of the Bottle Stores must educate their customers to drop empty bottles in litter cans. It is recommended that the topic of the next study be open ended, indicating the factors that influence littering. This will allow the respondents to elaborate more of other factors that cause littering.

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Appendix A

Questionnaire

Masters of Science in Environmental Science Questionnaires (UNISA)

This questionnaire forms part of the data collection methodology for the Masters project. The project is undertaken by me, Ronald Mathe, student no: 49128892, I have enrolled for Msc in Environmental Science with the University of South Africa (UNISA). For further clarities and information you can contact me on: 0739705383. This project is sponsored by the University of South Africa Master's and Doctorate Bursary. This project seeks to establish the perception of people on littering, why people litter and to check if income, gender, marital status and religious conviction have a bearing on littering.

The information and answers you provide on this questionnaire remain highly confidential, and no name of a person will be included during and after the undertaking of this project. Your answers will assist me to have the overall understanding of the perception people have on littering within your area, and to assess if whether income, gender, marital status and religious conviction have a bearing on littering.

This form is easy to fill and it will only take less than five minutes to complete. I appeal to you to be honest when responding to this questionnaire. You can fill it immediately or the fieldworker will come collect it before 24 hour period after delivery, or as per arrangement.

Your cooperation will be appreciated.

Ronald Mathe

_____

Please tick the box next to the most appropriate answer, as per your own discretion. Please tick the answer by putting the x on the box of the most appropriate answer.

My place of residence is?

Garsfontein ☐ Pretoria CBD ☐ Marabastad ☐

Gender

Male ☐ Female ☐

Age (in years)

0-17 ☐ **18-35** ☐ **36 and above** ☐

Educational Background

Never went to school ☐ Grade R to 7 ☐ Grade 8 to 12 ☐ Tertiary level ☐

Marital Status

Married ☐ Divorced ☐ Never Married ☐

How can you describe your religious commitment

Not/ never committed at all ☐ partially committed ☐ highly committed ☐

What is the range of your monthly income?

0-R7500 ☐ R7500-R15000 ☐ >R15000 ☐

Do you understand what "street littering" is?

Yes I know ☐ No I don't ☐

Do you think street littering is a problem?

It's not ☐ It has never been a problem ☐ it's a big problem ☐

Do you smoke?

No I don't ☐ Yes I do ☐

Where do you drop off the cigarette butt after smoking?

I don't smoke ☐ Rubbish Bin ☐ I drop it on the floor ☐

Do you consume food while walking, driving or in public facility?

Yes ☐ No ☐

Do you throw litter on the street?

Never ☐ only when there is no rubbish bin ☐ sometimes ☐ mostly ☐

How often do you litter?

Very often ☐ sometimes ☐ never ☐

Which of the following constitute most of your litter?

Paper ☐ bottles ☐ cigarette butts ☐ food packages ☐ I do not litter ☐

How do you judge your action to street littering?

Good ☐ partially good ☐ Bad ☐ Very Bad ☐ I don't litter ☐

Why do you litter?

☐ I don't ☐ unavailability of bins ☐ I am lazy ☐ the place is dirty already ☐

Do you have a problem when you see litter on the street?

Yes, I do ☐ No, I do not care ☐ yes, sometimes ☐ I am used to it ☐

Do you litter at home where you stay?

Never ☐ Sometimes ☐ yes, I do ☐

If you were to relocate to another area, will you regard cleanliness of the environment?

Yes ☐ No ☐

If public cleaning has to be conducted on streets, will you participate?

Yes ☐ never ☐ maybe ☐ when I have nothing to do ☐

Who do you think is responsible for street cleanliness?

Citizens ☐ Municipality ☐ Both the municipality and citizens ☐

Which of the following can stop people from littering?

Moral and religious conviction ☐

Better street cleanliness ☐

Public Awareness Campaigns ☐

Availability of rubbish bins ☐

Nothing will stop street littering ☐

Fines/ penalties ☐

Appendix B

Consent Form

CONSENT FORM

TITLE OF RESEARCH PROJECT

Effects of the biographic factors and religious convictions on the attitudes and practices related to street littering in Pretoria City, South Africa.

Dear Mr/Mrs/Miss/Ms _____ Date..…/..…/20...

NATURE AND PURPOSE OF THE STUDY

The study will therefore be conducted within Pretoria, the capital city of South Africa (Garsfontein, Pretoria Central Business District (CBD) and Marabastad). Littering is not only an environmental problem, but it is also the social problem caused by a behavioural practices. It is anticipated that this study will reveal some of the littering behavioural practices by Pretoria residents. The rationale for this research is to assess the effects of gender, age, income, marital status and religious convictions on the attitudes and practices related to street littering in Pretoria City. This will therefore assist us in coming with informed ways to deal with the littering problem.

RESEARCH PROCESS

The study will require your participation in either filling the questionnaire or being interviewed

You shall be given a reasonable time to fill the questionnaire and answer the interview

The questionnaire and interview questions shall be written in English, but it could be translated, when it is required

You are required to give your opinion in all the questions

The confidentiality of the participants is guarantee

There is no wrong or right answer.

There is no need to prepare for you to answer these questions

CONFIDENTIALITY

Confidentiality is guaranteed; the questionnaire has got no place where a name is required, and only in this form that your name will be required and it will not be exposed in any way. No data published in dissertations and journals will contain any information that will expose the participants.

WITHDRAWAL CLAUSE

I understand that I may withdraw from participating to the research at any time. I therefore participate voluntarily until such time as I request otherwise.

POTENTIAL BENEFITS OF THE STUDY

The research will reveal the gaps which are there in as far as waste management is concerned. Clean environment is likely to improve in our towns, cities and residential environment.

INFORMATION (contact information of your supervisor)

If I have any questions concerning the study, I may contact the supervisor, Professor Luke Chimuka, at the Department of Chemistry, University of Witwatersrand, Tel: 011 717 6703

CONSENT

I, the undersigned, ……..… (full name) have read the above information relating to the project and have also heard the verbal version, and declare that I understand it. I have been afforded the opportunity to discuss relevant aspects of the project with the project leader, and hereby declare that I agree voluntarily to participate in the project.

I indemnify the university and any employee or student of the university against any liability that I may incur during the course of the project.

I further undertake to make no claim against the university in respect of damages to my person or reputation that may be incurred as a result of the project/trial or through the fault of other participants, unless resulting from negligence on the part of the university, its employees or students.

I have received a signed copy of this consent form.

Signature of participant: .....

Signed at …… on ……

WITNESSES

.....

.....

Appendix C

CHI SQUARE CONTINGENCY TABLES

Gender

(a) Gender versus street littering

Gender	Never		When the bin is not there		Sometimes		Mostly		Row Total
	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	
Males	65	60.74	55	64.76	70	65.21	11	10.27	201
Females	71	75.25	90	80.23	76	80.78	12	12.72	249
Column Total	136		145		146		23		450

Degree of freedom= (r-1) (c-1) = (2-1) (4-1) = 3

Chi-square is 3.8

(b) Gender versus litter composition

	Paper		Bottles		Cigarette butts		Food Packages		Row Total
Gender	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	
Males	46	29.32	79	62.48	25	22.95	40	75.23	190
Females	0	16.67	19	35.51	11	13.04	78	42.76	108
Column Total	46		98		36		118		298

Degree of freedom= (r-1) (c-1) = (2-1) (4-1) = 3

Chi-square is 84.2

(c) Gender versus solution to littering

	Moral & Religious conviction		Better Street Cleanliness		Public awareness cmpaigns		Availability of Rubbish bins		Nothing		Fines /Penalties		Row Total
Gender	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	
Males	55	50.92	23	19.20	10	24.12	30	32.60	13	5.80	70	68.34	201
Females	59	63.08	20	23.79	44	29.88	43	40.39	0	7.19	83	84.66	249
Column Total	114		43		54		73		13		153		450

Degree of freedom= (r-1) (c-1) = (2-1) (6-1) = 5Chi-square is 47.13

Monthly Income

(d) Monthly income versus street littering

Monthly Income	Never		When the bin is not there		Sometimes		Mostly		Row Total
	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	
0-7500	15	30.22	60	32.22	15	32.55	10	5.11	100
7500-15000	56	42.31	55	45.11	27	45.42	2	7.15	140
>15000	65	63.46	30	67.66	104	68.13	11	10.73	210
Column Total	136		145		146		23		450

Degree of freedom= (r-1) (c-1) = (3-1) (4-1) = 6= 6

Chi-square is 103.28

(e) Monthly income versus litter composition

	Paper		Bottles		Cigarette butts		Food Packages		Row Total
Monthly Income	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	
0-7500	30	26.32	32	26.32	4	9.66	28	31.69	94
7500-15000	11	22.96	7	22.96	19	8.43	45	27.64	82
>15000	57	48.72	59	48.72	13	17.89	45	58.66	174
Column Total	98		98		36		118		350

Degree of freedom= (r-1) (c-1) = (3-1) (4-1) = 6

Chi-square is 52.82

(f) Monthly income versus solution to littering

	Moral & Religious conviction		Better Street Cleanliness		Public awareness campaigns		Availability of Rubbish bins		Nothing		Fines /Penalties		Row Total
Monthly income	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	
0-7500	14	26.34	6	9.93	7	12.48	27	17.79	5	2.12	45	35.36	104
7500-15000	22	34.45	18	12.99	40	16.32	40	23.27	0	2.72	16	46.24	136
>15000	78	53.2	19	20.06	7	25.2	10	35.93	4	4.2	92	71.4	210
Column Total	114		43		54		77		9		153		450

Degree of freedom= (r-1) (c-1) = (3-1) (6-1) = 10

Chi-square is 171.7

Religious convictions

(g) Religious convictions versus street littering

	Never		When thse bin is not there		sometime		Mostly		Row Total
Monthly income	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	
Never Committed	14	54.4	42	58	116	58.4	8	9.2	180
Partially committed	20	39.28	92	41.88	10	42.17	8	6.64	130
Highly Committed	102	42.31	11	45.11	20	45.42	7	7.15	140
Column Total	136		145		146		23		450

Degree of freedom= (r-1) (c-1) = (3-1) (4-1) = 6

Chi-square is 309.8

(h) Religious convictions versus littering composition

	Paper		Bottles		Cigarette butts		Food Packages		Row Total
Religious convictions	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	
Never Committed	51	44.8	48	44.8	33	15.08	28	53.94	160
Partially committed	37	34.16	43	34.16	2	12.54	40	41.13	122
Highly Committed	10	19.04	7	19.04	1	6.99	50	22.92	68
Column Total	98		98		36		118		350

Degree of freedom= (r-1) (c-1) = (3-1) (4-1) = 6

Chi-square is 95.24

(i) Religious convictions versus solution on littering

	Moral & Religious conviction		Better Street Cleanliness		Public awareness campaigns		Availability of Rubbish bins		Nothing		Fines /Penalties		Row Total
Religious convictions	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	
Never Committed	15	45.6	3	17.2	38	21.6	3	29.2	11	5.2	110	61.2	180
Partially committed	30	35.72	20	13.x47	5	16.92	54	22.87	2	4.07	30	47.94	141
Highly Committed	69	32.68	20	12.32	11	15.48	16	29.2	2	3.72	13	43.86	129
Column Total	114		43		54		73		13		153		450

Degree of freedom= (r-1) (c-1) = (3-1) (6-1) = 10

Chi-square is 236.78

Educational background

(j) Educational background versus street littering

	Never attended school		Never attended school		Never attended school		Never attended school		Row Total
Educational Background	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	
Never attended school	55	64.97	77	69.27	71	69.75	12	10.98	215
Grade R-7	1	0.30	0	0.32	0	0.32	0	0.05	1
Grade 8-12	2	0.60	0	0.64	0	0.64	0	0.10	2
Tertiary Level	78	70.11	68	74.75	75	75.27	11	11.85	232
Column Total	136		145		146		23		450

Degree of freedom= (r-1) (c-1) = (4-1) (4-1) = 9

Chi-square is 10.99

(k) Educational background versus Litter Composition

	Paper		Bottles		Cigarette butts		Food Packages		Row Total
Educational background	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	
Never attended school	9	43.09	68	47.99	27	17.6	87	82.27	191
Grade R-7	0	0.22	0	0.25	0	0.09	1	0.43	1
Grade 8-12	0	0.45	0	0.50	0	0.18	2	0.86	2
Tertiary Level	79	44.22	30	49.25	9	18.09	78	84.43	196
Column Total	88		98		36		168		390

Degree of freedom= (r-1) (c-1) = (4-1) (4-1) = 9
Chi-square is 84.45

(l) Educational background versus solutions to littering

Educational background	Moral & Religious conviction		Better Street Cleanliness		Public awareness campaigns		Availability of Rubbish bins		Nothing		Fines /Penalties		Row Total
	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	
Never	76	54.46	9	20.54	29	25.8	66	34.87	8	6.21	27	73.1	215

attended school													
Grade R-7	1	0.25	0	0.09	0	0.12	0	0.16	0	0.02	0	0.34	1
Grade 8-12	2	0.50	0	0.19	0	0.24	0	0.32	0	0.05	0	0.68	2
Tertiary Level	78	58.77	34	22.16	25	27.84	7	37.63	5	6.70	126	78.88	232
Column Total	114		43		54		73		13		153		450

Degree of freedom= (r-1) (c-1) = (4-1) (6-1) = 15
Chi-square is 151.42

Age

(m) Age versus street littering

	Never		When the bin is not there		Sometimes		Mostly		Row Total
Age (in Years)	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	
0-17	2	0.90	1	0.96	0	0.97	0	0.15	3
18-35	36	75.5	120	80.5	87	81.11	7	12.77	250
36 and above	98	59.5	24	63.4	59	63.9	16	10.06	197
Column Total	136		145		146		23		450

Degree of freedom= (r-1) (c-1) = (3-1) (4-1) = 6
Chi-square is 95

(n) Age versus Litter Composition

	Paper		Bottles		Cigarette butts		Food Packages		Row Total
Age (in Years)	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	
0-17	0	0	0	0	0	0	0	0	0
18-35	58	59.6	49	59.6	28	21.9	78	55.8	213
36 and above	40	38.3	49	38.3	8	10.9	40	46.1	137
Column Total	98		98		36		118		350

Degree of freedom= (r-1) (c-1) = (3-1) (4-1) = 6
Chi-square is 17.06

(o) Age versus solution to littering

	Moral & Religious conviction		Better Street Cleanliness		Public awareness campaigns		Availability of Rubbish bins		Nothing		Fines /Penalties		Row Total
Age (in Years)	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	
0-17	0	0.76	0	0.28	0	0.36	0	0.48	0	0.08	3	1.02	3
18-35	34	19.76	40	23.8	39	30	47	40.5	12	7.22	78	85	250
36 and above	80	49.9	3	18.8	15	23.6	26	31.9	1	5.69	72	66.9	197
Column Total	114		43		54		73		13		153		450

Degree of freedom= (r-1) (c-1) = (3-1) (6-1) = 10
Chi-square is 74.46

(p) Marital status versus street littering

	Never		When the bin is not there		Sometimes		Mostly		
Marital status	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	Row Total
Married	54	60.14	52	13.53	71	64.56	22	10.17	199
Divorced	11	12.69	2	64.12	29	13.62	0	2.14	42
Never married	71	63.16	91	67.34	46	67.8	1	10.68	209
Column Total	136		145		146		23		450

Degree of freedom= (r-1) (c-1) = (3-1) (4-1) = 6
Chi-square is 229.35

(q) Marital status versus litter composition

	Paper		Bottles		Cigarette butts		Food Packages		
Marital status	Obs	Exp	Obs	Exp	Obs	Exp	Obs	Exp	Row Total
Married	41	42	41	42	14	15.4	54	50.6	150
Divorced	12	9.8	10	9.8	9	3.6	4	11.8	35
Never married	45	46.2	47	46.2	13	16.7	60	55.6	165
Column Total	98		98		36		118		350

Degree of freedom= (r-1) (c-1) = (3-1) (4-1) = 6
Chi-square is 15.3

(r) Marital status versus litter composition

Marital status	Moral & Religious conviction		Better Street Cleanliness		Public awareness campaigns		Availability of Rubbish bins		Nothing		Fines /Penalties		Row Total
Married	39	50.41	15	19.01	26	23.88	58	32.28	6	5.74	55	67.66	199
Divorced	6	10.64	12	4.01	0	5.06	0	6.81	4	1.21	20	14.28	42
Never married	69	52.94	16	19.97	28	25.08	15	33.90	3	6.03	78	73.38	209
Column Total	114		43		54		73		13		153		450

Degree of freedom= (r-1) (c-1) = (3-1) (6-1) = 10
Chi-square is 82.85